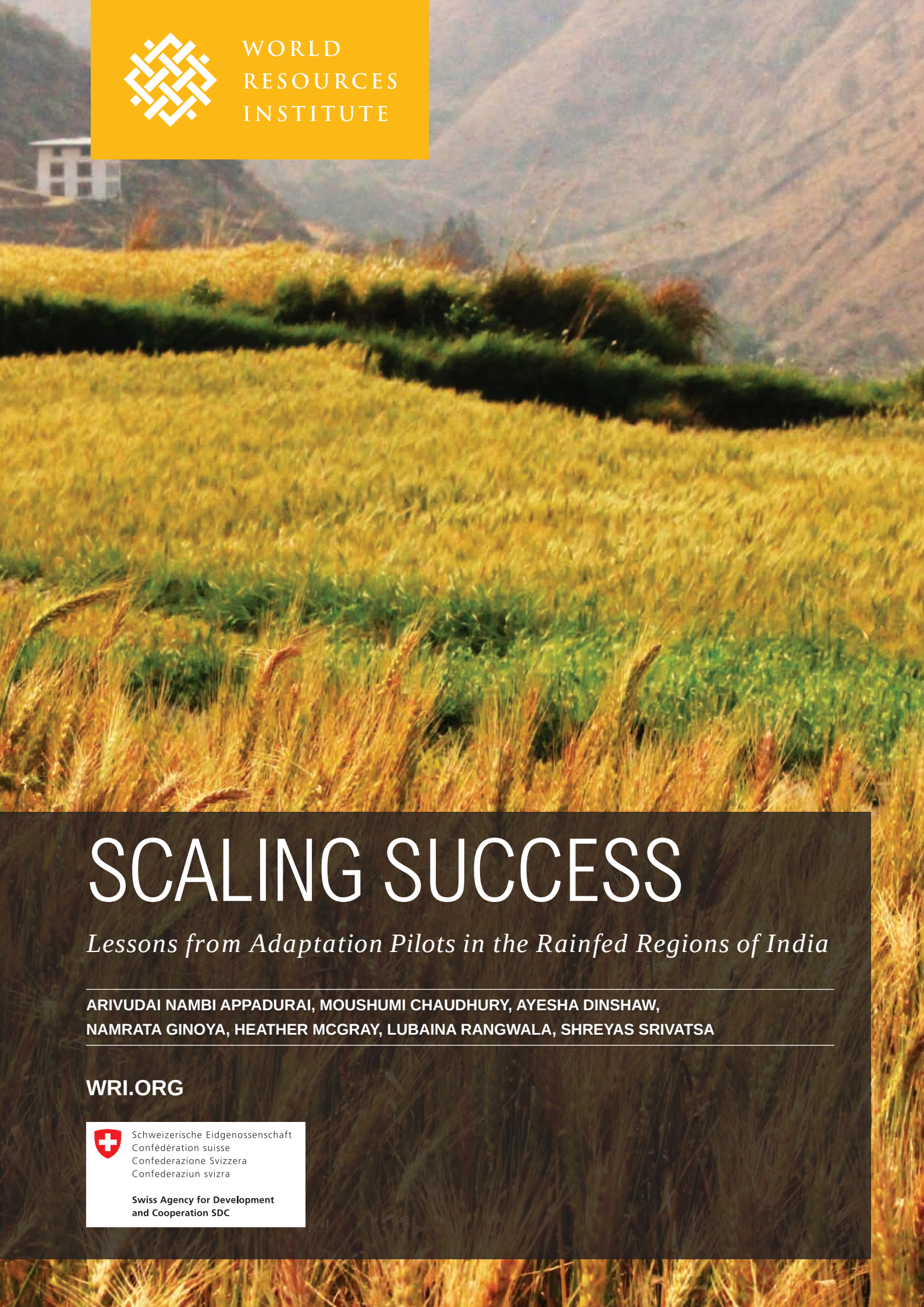

WORLD RESOURCES INSTITUTE

SCALING SUCCESS

Lessons from Adaptation Pilots in the Rainfed Regions of India

ARIVUDAI NAMBI APPADURAI, MOUSHUMI CHAUDHURY, AYESHA DINSHAW, NAMRATA GINOYA, HEATHER MCGRAY, LUBAINA RANGWALA, SHREYAS SRIVATSA

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FOREWORD

Nations around the world have recognized that the adverse effects of climate variations and change have a significant bearing on the food, water and livelihood security of millions of people. Greatest risks persist in economically less developed countries, where people's lives and livelihoods are highly vulnerable to stressors such as erratic rainfall, droughts, floods or cyclones. The poor communities are most disadvantaged, having little capacity to cope with changing climatic conditions, due to limited financial and often also technical means. The impact of climate change will presumably be particularly severe in rainfed areas, which constitute about 80 per cent of the cultivated land, producing about 65 to 70 percent of staple foods worldwide despite unsecure water availability.

In response to such climate change related challenges, many remarkable adaptation projects are being implemented, generating widespread interest among practitioners, policy makers and development agencies. Despite the growing interest in these experiences, they often remain individual, stand-alone initiatives. The need to rapidly scale up effective climate change adaptation interventions, through favorable policy frameworks and concrete action, is widely recognized. However, the challenge that we face is in identifying the elements that are necessary for successful scaling up of adaptation interventions.

As the climate continues to change, the capacity to iteratively adjust and learn – both at the policy level and in the course of implementation will be central to adaptation success. In this context, SDC is collaborating with the World Resources Institute (WRI) and the Watershed Organisation Trust (WOTR) for an initiative on 'Scaling up Good Adaptation Practices' (SUGAP) in India. This initiative was borne out of a need to understand the relevance of adaptation and resilience in the semi-arid context in India through focused case study research. The study "Scaling Success: Lessons from Adaptation Pilots in the Rainfed Regions of India" provides a synthesis of good practices and hands-on recommendations to practitioners, policy makers and funding agencies for identifying and scaling up effective adaptation interventions.

I would like to congratulate WRI for this very comprehensive assessment of adaptation projects in the rainfed areas of India and the development of a useful framework for understanding the process of scaling up. The study very clearly brings out that scaling up is a complex process and there is no prototype available for scaling-up effective adaptation practices. It is well acknowledged that Community Based Adaptation (CBA) is a key to strengthening the resilience of local communities. However, for up-scaling effective adaptation strategies it is necessary to leverage lessons learnt from successful adaptation projects and integrate them into sector relevant schemes and policies. Scaling requires an ecosystem of stakeholders as well as the incentive structure to ensure that adaptation imperatives become part of policy discourse and action. I am hopeful that this study will be a valuable contribution to further catalyse the scaling up of climate resilient development interventions and integrating adaptation within the existing development policy frameworks.

Pio Wennubst
Assistant Director General, Head of the Directorate Global Cooperation, Swiss Agency for Development and Cooperation (SDC), Federal Department of Foreign Affairs, Switzerland

FOREWORD

For too long, climate change adaptation has been characterized by individual efforts within small pilot projects. It is becoming increasingly clear that such limited, one-off projects do not match the complex challenges the world faces as the impacts of climate change mount. Adaptation activities must become standard practice before climate-vulnerable development pathways are entrenched. The World Resources Institute (WRI) seeks to contribute to this important shift through this report, "Scaling Success: Lessons from Adaptation Pilots in the Rainfed Regions of India."

Drawing on the experiences of twenty-one adaptation projects from this region, the report suggests solutions to a key challenge—how to bring efforts to scale without neglecting the many location-specific factors (environmental, social, economic, and political) that shape climate risk. In short:

- ***It is time to think bigger***. Adaptation activities need to shift from one-off, small-scale activities to those that benefit more people and inform policy.

- ***Scaling starts at the design phase and requires dedicated resources***. Project implementers, policy makers, and donors should consider the components of the scaling framework prior to the start of a project or policy implementation process to identify how adaptation activities could scale. For successful scaling, funding and human resources should be set aside or explicitly accessible.

- ***Coordination and knowledge sharing among actors is key***. Scaling requires multiple actors across various landscapes to coordinate their adaptation activities. Sharing lessons learned is the most important enabling condition in scaling.

- ***Community participation and ownership is key***. Communities should be engaged throughout the design, implementation, and reporting of results of an adaptation tracking system to ensure that their view of success is integrated and to have them assist in data collection and outreach.

- ***There is no one-size-fits-all approach to scale adaptation strategies***. While there are clear indicators of good adaptation practice, the successful scaling of a project is context specific. When designing scaling strategies, various pathways, actors, and conditions that could impact scaling efforts need to be identified and addressed to minimize the future challenges of scaling adaptation activities.

This report provides a new perspective and a way forward. It proposes a valuable conceptual framework for identifying emerging good adaptation practices and the conditions necessary for scaling these practices. It is my hope that it will assist key players at local, national, and international levels in championing the scaling agenda.

Andrew Steer
President and CEO
World Resources Institute

EXECUTIVE SUMMARY

As climate change threatens India's food security, adaptation in the agriculture sector is becoming increasingly important. However, for too long, adaptation has been characterized by individual efforts and by small, time-bound pilot projects. Although these projects often have a strong grassroots focus, their capacity to benefit larger populations and to contribute to policy reform is limited (Reid and Huq 2014).

Funding agencies, policy makers, practitioners, and the public are seeking large-scale, transformational solutions to adapt to climate change. At the same time, initiatives that scale adaptation are increasingly possible because of the deployment of national and international adaptation funds and the advent of players like the Green Climate Fund. In India, the progressive agenda set forth by the new government pushes for big thinking and a focus on skills, scale, and speed. Taken together, these developments create opportunities to move beyond modest projects toward large-scale improvements.

Scaling Adaptation in Rainfed Areas

In India, scaling adaptation is of particular importance in rainfed agricultural areas, where crops depend upon monsoon rains. In 2012, rainfed agriculture occupied approximately 58 percent of India's cultivated area and contributed 40 percent to its food production (Venkateswarlu and Prasad 2012). Projections indicate that, without adaptation, climate change will stress rainfed agricultural systems, with potentially significant decreases in yield and a loss in farm-level net revenue of between 9 percent and 25 percent in the South Asia region (Manava and Robert 2011).

This report aims to accelerate scaling of adaptation in rainfed India by providing a framework to enable project implementers, funding agencies, and policy makers to understand the process of scaling and identify activities that are ready for scaling in rainfed India. This scaling framework is described next.

Scaling Adaptation Framework

When determining if an adaptation intervention is ready for scaling, implementers face two main challenges: (i) identifying the right indicators of good adaptation practice to ensure effective adaptation activities are scaled; (ii) understanding the possible approaches for getting to scale and choosing the appropriate one. To date, there is limited understanding of what indicates good adaptation practice, how to identify and undertake suitable good adaptation interventions, and subsequently how to scale such interventions.

A framework is a tool that helps funders, policy makers, and practitioners understand how to utilize the growing body of knowledge on good adaptation practice and scaling, to ensure more effective and large-scale adaptation efforts over time. To this end, the authors developed a framework and applied it across select case studies. The framework proposed in this report integrates the questions, what is good adaptation and how can it be successfully scaled.

In this report, the framework developed by the authors serves as the basis of the study. The framework helps to understand the process of scaling and identify prospects for scaling adaptation projects in rainfed areas of India. The framework can be used by

- policy makers, project implementers, funding agencies, and others to examine an existing adaptation project to evaluate its prospects for scaling in the future;
- project implementers to design projects with scaling potential;
- policy makers to inform the development of policies or programs that support scaling of adaptation activities, or to accelerate the scaling of adaptation by modifying existing policies or programs; and
- funding agencies to design investment initiatives or to assess projects that seek funding, so that investments are more likely to provide a maximum adaptation benefit.

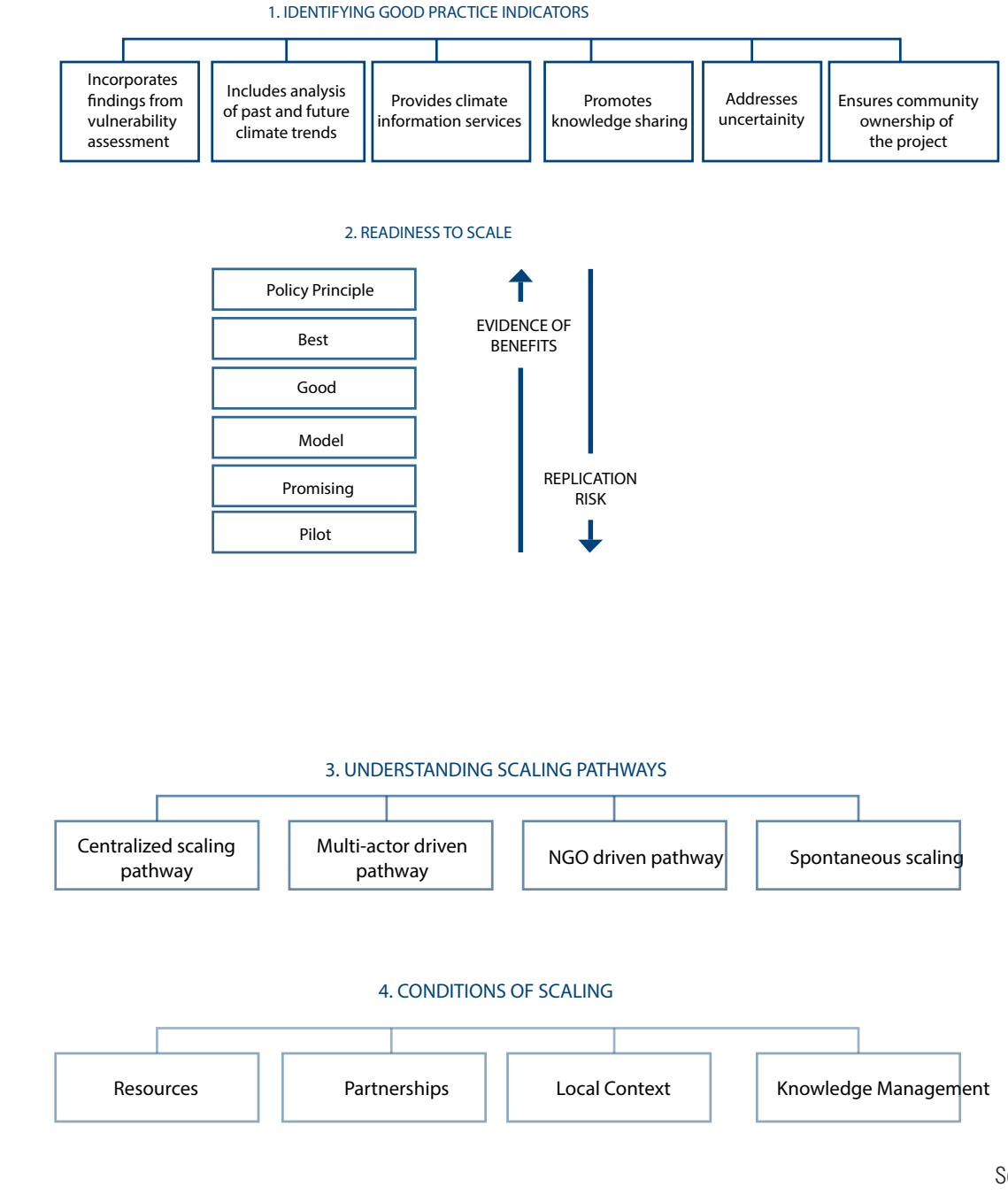
The four parts of the adaptation scaling framework are depicted in Figure ES-1 are also briefly described here.

- **Good adaptation practice indicators**. As a first step, the authors identified six indicators of good adaptation practice that are part of the framework.
  - **Incorporates findings from vulnerability assessments**. Vulnerability assessments gauge exposure and sensitivity to social, economic, and natural vulnerabilities within a system and a given context. The results of the assessment should inform the design of adaptation projects so that they reduce vulnerability over time.
  - **Incorporates analysis of past and future climate trends**. In order to plan for long-term climate change, adaptation planners should integrate data and information on both past and

future climate trends into the design of adaptation projects. This is often integrated by incorporating findings from a vulnerability, risk, or impacts assessment.

- **Provides climate information services**. While not appropriate for every adaptation project, climate information services, such as weather advisories, can help beneficiaries make informed decisions. This is especially true for the agricultural activities that people in rainfed areas of India depend on.
- **Promotes knowledge sharing.** Iterative learning is central to adaptation and enables practitioners to adjust and improve their activities as circumstances change or new information becomes available. Feedback loops within the project help modify the project as it scales and ensure that activities are successfully adapted to new contexts. Meanwhile, knowledge sharing among institutions and projects enables further scaling of good adaptation practices.
- **Addresses uncertainty**. To respond to the high degree of uncertainty associated with climate impacts, adaptation practices should be flexible in responding to changing needs and robust under uncertain conditions (Adger et al. 2005; Sterrett 2011).

Figure ES-1 | **Adaptation Scaling Framework**



- ***Ensures community ownership of the project.*** Equitable participation by local communities helps adaptation activities to become sustainable and relevant to the context in which they are applied (Adger et al. 2005).

- **Scaling readiness**. The second part of the framework assesses the stage of scaling readiness of a project. The World Bank (2003) provides a continuum of scaling readiness, from "pilot" to "policy principle" with four stages in between. Projects can move along this continuum toward greater scale depending on two factors: evidence that the project activities are beneficial; and decreasing risks associated with scaling. These two factors are inversely related; as evidence of benefit increases, the risks associated with replication decrease, and projects are more able and likely to achieve scale.

- **Scaling pathways**. The third part of the framework identifies common "scaling pathways" that chart how a project's activities can scale. A project usually travels either vertically or horizontally across local, meso, and macro levels on a pathway. Horizontal scaling occurs when a project replicates across people and geographies for all levels of scaling (Hartmann and Linn 2007; Linn 2012). Vertical scaling leads to changes in policies and legislation at the national, regional, or local level (Hartmann and Linn 2007; Linn 2012). The authors identify four generic pathways through which scaling may occur, based on lessons from successful development activities.
  - ***Centralized scaling*** begins with action by a central government actor.
  - ***Multi-actor scaling***, as its name implies, is driven by multiple actors. For example, this pathway might start with the actions of a non-governmental organization (NGO) but also requires engagement from the government and individual farmers before scaling is achieved.
  - ***NGO-driven scaling*** typically starts at the local level. It may entail singular expansion by a single NGO or decentralized replication by several NGOs.
  - ***Spontaneous scaling*** occurs when individuals replicate an innovation or practice informally and without deliberate guidance from formal actors such as the government or an NGO.

- **Conditions for scaling**. Each case was analyzed for four sets of conditions that enable scaling.
  - ***Resources*** include financial resources, social capital, time, technology, and the presence or absence of institutional capacity.
  - ***Partnerships and networks*** include public–private partnerships, engagement of NGOs in government programs, and participation in networks.
  - ***Local context*** factors include community ownership of a project or activity, absorptive capacity for what a project offers, and a range of cultural or environmental factors.
  - ***Knowledge management*** factors include monitoring and evaluation (M&E), communications, and learning in the face of uncertainty.

Project Findings

The authors applied the framework to twenty-one adaptation projects to get a sense of the types of adaptation activities underway in the rainfed regions of India and the current state of scaling within these projects. The chosen projects mainly include adaptive agricultural activities in five categories: water provision, water conservation, farm management, soil management, and crop improvement. The authors chose projects by first undertaking a literature review of the various adaptation interventions currently underway in the rainfed areas of India by using secondary sources. Because there is limited information available through secondary sources about on-the-ground practices, the authors interviewed project implementers in the twenty-one projects to scope out projects that explicitly focus on adaptation activities in rainfed areas of India.

From the twenty-one projects, authors chose to conduct four deep dive interviews. In order to develop the four deep dive case studies, the authors considered the range of conditions for scaling met by the projects. The criteria included

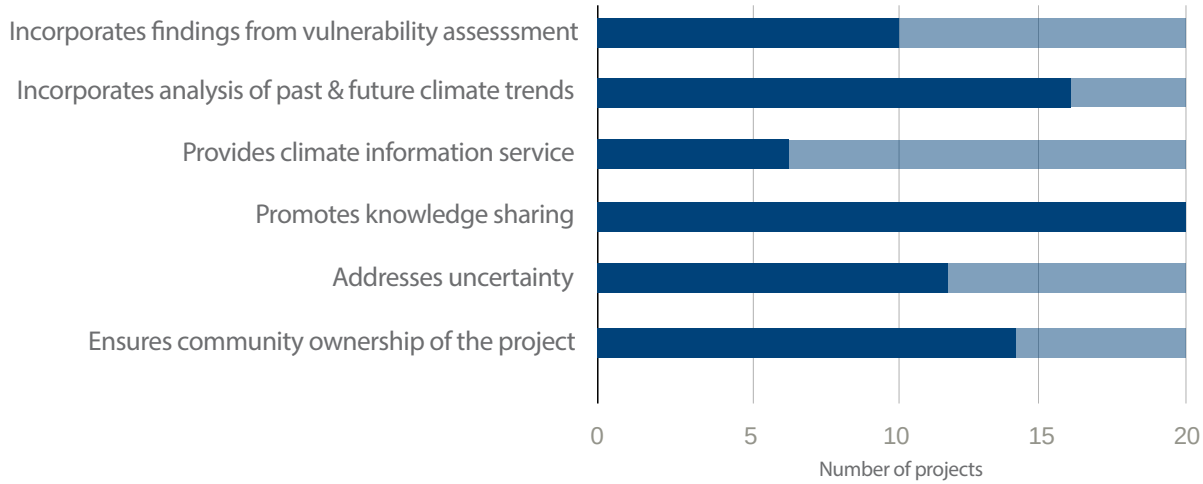
choosing adaptation projects, a diverse set of case studies at various stages of scaling, a range of conditions for scaling, a clear scaling pathway; and assessing quality of the scoping interview, and the availability of project personnel for a deep dive interview. It is important to note that the case studies do not attempt to identify projects as "successes" or "failures"; rather, the framework is used to shed light on how each project has been scaled thus far.

The twenty-one projects showed mixed results with regard to the good practice indicators. Several projects address all these areas of good practice, while others address only on one or two. Of the indicators, knowledge sharing had the strongest showing (20 projects), while climate information service provision had the weakest (7 projects). Other trends were as follows:

- ***Vulnerability assessments***: Ten projects undertook vulnerability assessments, but only five of these emphasized the assessment in the project plan.
- ***Past and future climate trends***: Half of the projects reviewed incorporated climate analysis, including climate and crop modeling, and past, present, and projected climate trends. Typically, the larger, better-funded organizations have the financial and human capacity to incorporate this analysis into projects.
- ***Information services***: There are many ways to provide climate information, ranging from technologically based services to training farmers to collect weather information and providing agro-advisories for subscribing farmers. Few of the organizations interviewed undertook climate information service provision. This may be because it requires high capital inputs and strong support systems.
- ***Knowledge sharing***: Most of the organizations interviewed focused strongly on knowledge sharing, ranging from directly informing national policies and schemes to sharing knowledge with local populations through workshops and integrating lessons learned into online knowledge platforms.
- ***Addressing uncertainty***: Twelve of the twenty-one projects had activities that addressed the uncertainty associated with climate change. These included a range of capacity building activities to help beneficiaries apply information and make decisions under uncertain climatic conditions.
- ***Community ownership***: Fourteen projects included measures to promote community ownership of project activities. Interviews suggested that ownership increases the chances of a project being successful and sustained over long term.

Figure ES-2 shows the number of reviewed projects that met each indicator of good practice.

Figure ES-2 | **Good Adaptation Practice Indicators**



With regard to scaling conditions, the project review yielded the following insights:

- **Resources**: Among those projects that planned explicitly for scaling, only in a few cases was funding set aside or accessible explicitly for scaling. Scaling efforts are hinged more on human resources than on any other resources.
- **Partnerships**: Sixteen out of twenty-one projects stated that partnerships between NGOs and government agricultural extension agencies are critical for scaling adaptation activities.
- **Local context**: In half of the projects, limited acceptance of the project by the farming community negatively affected scaling, followed by lack of community ownership of the project.
- **Knowledge management**: Sharing lessons learned is the most important enabling condition for scaling. Sixteen out of twenty-one projects had M&E systems in place to track scaling of adaptation activities, which increases the extent to which successful scaling can occur.

Figure ES-3 provides an assessment summary of the scaling conditions found across the twenty-one projects reviewed in this report.

Case Study Findings

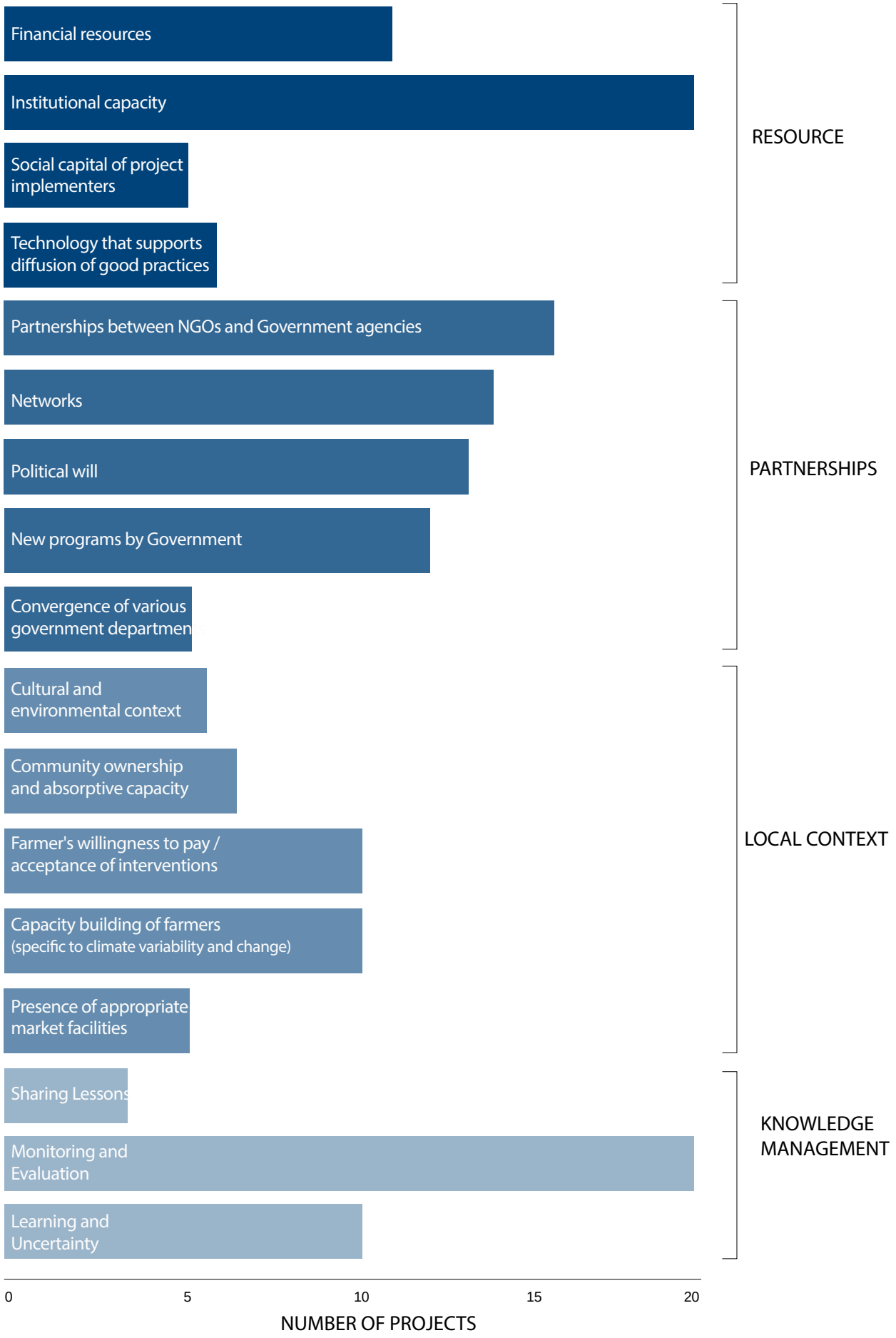
The authors applied the framework to four in-depth case studies to gain a deeper understanding of how adaptation activities have been scaled in rainfed India thus far. Here is an overview of each of the four case studies and the key findings from applying the scaling framework to these.

- **The Watershed Support Services and Activities Network (WASSAN)** implemented a basket of adaptive agricultural activities in two of Andhra Pradesh's poorest, most drought-prone districts. The project met most of the good practice indicators and was judged to be at the "model" stage of scaling. In spite of being led by an NGO, the project appears to be on a "multi-actor scaling pathway," with the following key scaling conditions in place: strong awareness of community capacity and social capital; creation of an Andhra Pradesh Drought Adaptation Initiative (APDAI) cell within the Office of the Commissioner for Rural Development; early engagement of farmers in the design and implementation of the project; partnerships with local institutions; and WASSAN's leadership of the Revitalizing Rainfed Agriculture network. No funding was allocated specifically for scaling.

- **The Indian Agricultural Research Institute (IARI)** and several partners implemented a strategy to enhance adaptive capacity in vulnerable regions, which focused on crop and farm management, provision of an agro-weather advisory, and skills training. The project met all the good practice indicators and was considered to be at the "model" stage of scaling. This project followed a "centralized scaling" pathway, as it is implemented by a consortium of mandated national- and state-level agricultural research organizations. This project highlights the value of building local institutions and fostering partnerships at different levels as an effective means to promote scaling. For instance, the project set up a "Village Resource Centre" in village blocks to manage the inventory of common resources and act as a forum for farmers to share experiences of using adaptation technologies; it also partnered with the private company Tata Consultancy Limited to pilot the mobile-based weather information services.

- **The Watershed Organisation Trust (WOTR)** has climate change adaptation (CCA) projects in forty-nine villages, which scaled to an additional twenty-three villages. The project activities focused on crop and farm management, an agro-weather advisory, water conservation, and a suite of non-farming activities. WOTR met all the good practice indicators; however, its activities were considered to be at the "promising" stage of scaling. WOTR followed the "NGO-driven" pathway to scaling, although partnerships played a significant role in its scaling trajectory. These partners include those at the meso level, as well as organizations such as the National Bank for Agriculture and Rural Development (NABARD) at the national level. This case study shows how strategic partnerships for

Figure ES-3 | **Assessment Summary of Projects by Scaling Conditions**



locale-specific activities can emerge as an effective means of scaling. In addition, WOTR focused on capacity building efforts and community involvement in their efforts to scale the project.

- **Unnati's** project "Strengthening Community Capacity on Disaster Risk Reduction in Rajasthan" focused on vulnerability reduction in the dalit[1] community in Rajasthan. Unnati sought to promote food, water, and livelihood security among dalits by providing livelihood options and continuous access to water, and the project followed an NGO-driven scaling pathway. Although the project's target population was dalit communities, it could potentially benefit other vulnerable and marginalized groups: several communities have expressed interest in or adopted some of the project's horticulture activities. However, the scaling risk is high, as the evidence is drawn from only two districts of Rajasthan. Although the project met most of the indicators of good practice and the community ownership model promoted through co-financing was particularly effective in reducing vulnerability, several conditions such as financial resources, local context, and partnerships limited the scaling potential of the Unnati project and it remains in the pilot stage of scaling.

Key insights from the case studies are as follows:

- *Vulnerability assessments coupled with climate trend analysis provide an important basis for adaptation planning*. For example, in the case of IARI, climate analysis along with analysis of parameters like soil profile, water availability, and vegetative cover have enabled an appropriate choice of seed varieties for a given location. WASSAN and WOTR have also used such assessments as a preparatory exercise at the early stage of projects in selected locales.

- Interview respondents agreed that *the right information at the right time is critical to managing climate risks in climate-sensitive sectors like agriculture*. Locale-specific agro-advisories have been found useful in saving input-related resources and deploying appropriate agronomic activities.

- *Strategic partnerships are critical for effective scaling, though their form may vary*. IARI is a national institution with a nationwide research mandate. Its presence across the country and ability to work with multiple partners seem to offer an advantage in facilitating a certain degree of scaling. In contrast, WASSAN has been able to create scaling opportunities predominantly by integrating activities with government agencies.

- *Investments in local institutions appear to pay off when it comes to scaling*. In the projects run by WASSAN and WOTR, a conscious effort was made to invest in community institution building in order to sustain local capacities over longer periods. Unnati and WOTR also found the establishment of resource centers or similar village facilities to be productive.

- *Adaptation technologies are helpful but affordability remains a factor*. Case study findings suggest that farmers are receptive to technologies that help them adapt, such as cell phones by which they receive weather information. However, the extent to which farmers can use such technological resources depends on the cost of the technology and whether funding is available to access them through loans or credit schemes. In several projects, subsidies play a critical role in scaling the use of technologies for adaptation.

- *Community ownership of a project appears to be important for scaling*. For example, WASSAN and IARI have generally emphasized the need to build strong leadership and grassroots organizations to better manage natural resources under climate variance. They promote the involvement of the state government and village-level organizations to create ownership.

Conclusions and Recommendations

When determining if an adaptation intervention is ready for scaling, implementers face the challenge of identifying the right indicators of

good adaptation practice to ensure effective adaptation activities are scaled. This is challenging for several reasons: (i) adaptation activities in different contexts look very different from each other, which makes it difficult to determine what is "good"; (ii) climate change is inherently a long-term phenomenon, and adaptation efforts are rarely monitored or evaluated for success beyond five years; (iii) despite improved climate projections, climate impacts are still uncertain, which makes it impossible to know whether adaptation efforts will be successful in the future; and (iv) it is difficult to know when a reduction in vulnerability or an increase in adaptability is due to an adaptation project or another driver. Another challenge that those trying to scale up adaptation activities face is limited understanding of possible approaches to scaling and criteria for choosing the appropriate one. These challenges make the concept of "good adaptation" one that is still evolving. More research on what adaptation activities work will help clarify what is "good" and fit for scaling.

To date, there is limited understanding of what indicates good adaptation practice, how to identify and undertake suitable good adaptation interventions, and subsequently how to scale such interventions. Therefore, the scaling framework in this report helps not only to identify good adaptation practices, but also to understand and analyze the process of scaling. There are several conclusions that can be drawn about the scaling adaptation framework.

- Working with multiple actors is a challenge due to differing agendas and complex relationships. Additionally, working across geographies with multiple actors and scales poses more challenges with regards to identifying which partner to work with and how, in order to scale successfully. Although there can be tensions between partners while deciding on how to scale adaptation activities, partnerships also provide an avenue for working together to successfully scale adaptation activities.

- There is no blueprint for scaling

adaptation practices. Considering the numerous pathways and conditions that determine scaling, there is no one "right" way to scale adaptation activities. When designing scaling strategies, various pathways, actors, and conditions that could impact scaling efforts need to be identified and addressed to minimize future challenges of scaling adaptation activities.

Recommendations for Identifying and Enabling Good Adaptation

The case studies suggest that several factors influence an adaptation project's ability to deliver desired results. These include good management plans; alignment with relevant national and state policies; emphasis on technical fit, cost effectiveness, flexibility, appropriate skill sets, and building resilience to uncertainty; and attention to equity issues. In addition, implementers, policy makers, and funders can play specific roles.

Implementers should

- systematically identify and document existing adaptation success and farmer innovations, and assess whether they qualify as "good" adaptation;
- build vulnerability assessment and climate trend analyses into the early stages of project design and implementation;
- address the need for climate information services—such as agro-advisories, seasonal forecasting, and early warning systems—as elements of adaptation in monsoon-dependent, rainfed agricultural contexts; and
- address the uncertainty inherent in climate change by building the capacity of project

teams and beneficiaries to understand the drivers of climate risk, so that they can make appropriate choices.

Policy makers should

- integrate successful adaptation initiatives into government schemes and policies that address the agriculture and water sectors. The authors observed that when there was a buy-in from the government the projects had enhanced reach and fewer risks for scaling; and
- focus on developing and strengthening practical and cost-effective resource management schemes besides promoting knowledge management.

Funding agencies should

- pay special attention to promoting good adaptation practices. This would entail a thorough understanding of the indicators of good adaptation practice;
- focus on (i) training programs that would help project staff to identify and cultivate indicators of good adaptation practice; (ii) M&E systems to track good adaptation interventions; and
- devote resources to the collection and communication of best practices across agencies and communities. Knowledge and information sharing is central.

Conclusions and Recommendations on Scaling Adaptation

In the scaling context, processes, pathways, and conditions count. The assessments and findings led to the following recommendations:

Implementers should

- identify activities that are already showing potential for scaling;
- systematically assess both the enabling factors and the barriers that inhibit the scaling of effective activities and device strategies to identify appropriate scaling pathways. The scaling adaptation framework can be used for this effort;
- expand communications and outreach about successful adaptation to prompt widespread acceptance and scaling of successful activities;
- promote monitoring, assessment, and feedback that can enhance scaling; and
- foster partnerships and networks to address capacity gaps that limit scaling.

Policy makers should

- define targets, geographic areas, skills, and required financial resources for scaling adaptation, so that scaling efforts can be targeted;
- establish mechanisms that enable scaling, especially through policy. For example, the emerging state action plans for climate change under the National Action Plan on Climate Change should consider devising an innovative incentive mechanism to promote scaling;
- align support for specific potential interventions with state and national policies and schemes; and
- promote collaboration among researchers, practitioners, policy makers, funding agencies, and NGOs.

Funding agencies should

- initiate adaptation activities that have a clear, replicable, cost-effective, and demonstrable technology with provision for a self-sustained funding mechanism;
- create a checklist for scaling, taking into consideration elements such as appropriateness of adaptation technology, geography, organizational endowments, household endowments, networks, sound results-based M&E framework and knowledge-sharing platforms; and
- to the extent possible, create a mandate to fund projects that focus on scaling efforts in the adaptation domain

CHAPTER 1

INTRODUCTION

As a monsoon-dependent country, India's food security is significantly determined by the performance of rainfed agriculture. As climate change threatens India's food security, adaptation in the agriculture sector is becoming increasingly important. However, for too long, adaptation has been characterized by individual efforts and by small, time-bound pilot projects. Although these projects often have a strong grassroots focus, their capacity to benefit larger populations and to contribute to policy reform is limited (Reid and Huq 2014).

Funders, policy makers, practitioners, and the public are seeking large-scale transformational solutions. At the same time, the operationalization of national and international adaptation funds and the advent of players like the Green Climate Fund make scaling of adaptation initiatives increasingly possible. In India, the progressive agenda set forth by the new government pushes for thinking big and focusing on skills, scale, and speed. Taken together, these developments create opportunities to move beyond modest projects toward large-scale improvements.

The majority of small and marginal farmers in India practice rainfed agriculture, in which crops depend on good monsoon rains. Therefore, rainfed agriculture is highly vulnerable to drought, land degradation, and soil moisture stress. Historically, these farmers have had to continuously adapt to changing circumstances. However, recently, with rapid variations in climatic, market, and social conditions, traditional adaptation options have become less effective, revealing a need to promote appropriate adaptation interventions across rainfed regions. Because the dynamics of rainfed agriculture are complex, this is no simple task.

The groundwork for scaling adaptation in the rainfed regions of India is already in place. Adaptation has been a feature of many agriculture projects in India over the past decade, and several policies and plans have already been set up to support adaptation in the agriculture sector. This report aims to facilitate more rapid scaling of beneficial adaptation activities in rainfed India by helping project implementers, funding agencies, and policy makers understand the process of scaling adaptation activities.

1.1 Local Projects: The Focus of This Report

Using the adaptation scaling framework that is presented in Chapter 2, this report examines twenty-one individual projects to understand prospects for scaling adaptation. In this report, a "project" refers to a set of time-bound activities designed to produce a unique product, service, or result that will reduce the vulnerability of farmers to climate change. The report focuses on projects because of their prevalence as a unit of adaptation action in rainfed India and elsewhere. In addition, the community-scale focus of project-based adaptation offers several benefits, such as flexibility to respond to local contexts and to engage local stakeholders. However, the potential impacts of climate change require adaptation on a large scale. While large-scale adaptation planning and climate risk mainstreaming have begun, most adaptation efforts remain within the context of discrete projects. Experience from these projects should serve as a starting point for scaling.

1.2 India's Rainfed Agriculture

A region is considered rainfed if it has less than 40 percent net irrigated area (Gautam and Rao 2007). The major determinants of a rainfed region are the amount of rainfall (500–750 mm) and a growing season that does not exceed 200 days. Rainfed agriculture in India is typically practiced in arid and semi-arid areas, by small and often marginalized farmers. The northern arid and semi-arid regions in India cover parts of Gujarat, Punjab, and the desert of Rajasthan. The majority of the southern arid and semi-arid regions fall within the Western Ghats, covering the states of Maharashtra, Karnataka, and Tamil Nadu.

In India, agriculture contributes 21 percent to the gross domestic product and 11 percent to total exports. It employs 56.4 percent of the total workforce while supporting 600 million people directly or indirectly (GOI 2008). Rainfed agriculture in particular is pivotal to India's economy and food security. In 2012, rainfed agriculture occupied approximately 58 percent of India's cultivated area and contributed 40 percent to its food production (Venkateswarlu and Prasad 2012). Rainfed agricultural lands in India produce a vast amount of staples. For instance, in 2012 rainfed agriculture was the source of 50 percent of the country's cereals, 77 percent of its oilseeds and 85 percent of its pulses (ICARDA 2012). Rainfed agriculture supports 40 percent of India's food demand of 1.2 billion people and 60 percent of India's livestock population (Jat et al. 2012).

Projections indicate that climate change will stress rainfed agricultural systems in India.

For instance, the recently published IPCC Fifth Assessment Report projects that there will be an increase of 2–3°C in the northern region of India in the midterm (2046–2065) and an increase of 3–5°C in the long term (2081–2100). Such increases would have a significant detrimental impact on India's rainfed agriculture: a study by Manava and Robert (2011) observes that decreased yields of non-irrigated wheat and rice will be significant for a temperature increase beyond 2.5°C, incurring a loss in farm-level net revenue of between 9 percent and 25 percent in the South Asia region.

In states such as Andhra Pradesh, an increase in temperature by 1°C during the main cropping season (southwest monsoon) is projected to reduce net income of farmers significantly, particularly for the rice crop, assuming current technology and management attributes. There is already evidence that increases in temperature and carbon emissions on farms have reduced the biomass and yield of rice, green gram, pigeon pea, wheat, and chickpea grown in arid and semi-arid regions (IARI/CRIDA 2009). While such impacts are associated directly with a rise in temperature, impacts due to water availability, changing soil moisture status, pest and disease incidence, and decline in farm labor productivity are also likely to be felt. For instance, soil moisture is projected to change with fluctuations in precipitation, runoff, percolation, evaporation, and rainfall distribution. However, soil moisture is very hard to predict (Dinar et al. 1998).

The most significant impacts are likely to be borne by smallholder rainfed farmers (about 40 percent of the 98 million of the small and marginal land holders in India), who constitute the majority of farmers in rainfed agricultural regions and possess low financial and technical capacity to adapt to climate variability and change (Nambi 2014). Adaptation will need to take place over the short and medium term (farmers will need to build their livelihood resilience to cope with existing weather-induced risk) as well as over the medium to long term (farmers need to adapt their farming practices to a new set of weather-induced risks and opportunities) (Jat et al. 2012). However, currently there is little clarity on what adaptation interventions are most appropriate in rainfed agricultural areas and whether they are ready to be scaled.

At the national level, India has responded to the challenge of adapting rainfed agriculture to climate change with a mix of old and relatively new policies, programs, and schemes implemented across numerous ministries and departments. Annex I lists the policies and schemes most relevant to adaptation in the context of rainfed agriculture in India. These policies are at various stages of implementation and have thus far yielded mixed results. This is largely due to the lack of coherence among initiatives, institutional capacities, and monitoring structures, and due to the inadequacies in identifying good practices and activities that could be scaled. Often, incongruent objectives of agricultural policies contribute to underperformance and non-realization of adaptation objectives. For example, on the one hand policies are conceived and implemented to strengthen the natural resource base to make agriculture more sustainable, but on the other hand policies aimed at providing subsidies for farm inputs like electricity, fertilizers, and pesticides do not help achieve desired adaptation results (Lwasa 2014).

1.3 Report Overview

This report is organized into five chapters, beginning with this introduction (Chapter 1). Chapter 2 describes the four-part scaling adaptation framework, which helps to understand the process of scaling adaptation activities. The four parts of the framework are indicators of good adaptation practice, readiness to scale, scaling pathways, and conditions that affect scaling.

Drawing on the scaling adaptation framework, the authors developed a questionnaire that was used to interview project managers from twenty-one agricultural adaptation projects in rainfed India, identified through a literature review. Chapter 3 presents a synthesis of the interview responses, providing a picture of what efforts to scale adaptation actually look like on the ground in India's rainfed areas. The twenty-one projects described in Chapter 3 are indicative of the types of adaptation efforts underway in the rainfed agricultural regions of India. The analysis of the interviews with project managers provides insight into not only the types of adaptation activities and projects currently underway, but also the degree to which these projects represent good adaptation and the extent to which they meet the conditions that are required to scale adaptation activities and projects.

Chapter 4 takes a deep dive into four case studies selected from the twenty-one projects synthesized in Chapter 3. The case studies were developed through additional interviews with project staff, and they provide detailed insights into scaling adaptation by using the scaling adaptation framework. The case studies are representative of a range of projects and offer a window into how and why some adaptation projects have been scaled, while others have not. Each case study considers the conditions for scaling that have been met, the pathway by which scaling has begun to occur, and the potential for future scaling and recommendations for how to accomplish this.

Finally, Chapter 5 presents conclusions on the scaling adaptation framework and projects reviewed. Chapter 5 also offers recommendations for policy makers, funding agencies, and project implementers working to scale adaptation.
It is important to note that the data on the twenty-one projects reviewed for this report, including the four detailed case studies, were derived mostly from interviews with researchers and project staff, supplemented by evaluation documents and secondary sources when possible. A detailed account of the report's methodology is set out in Annex B, along with the list of people interviewed (Annex C), and the questionnaires used to interview project staff and policymakers (Annexes D, E, and F).

This report recognizes that scaling is a complex process, and the choice of what and how to scale depends on the specific context, the mix of players, the nature of interventions, and the incentives for scaling. Although there is substantial potential for improving and scaling adaptation in rainfed regions, doing so will require significant and sustained effort over the coming decades.

CHAPTER 2

SCALING ADAPTATION FRAMEWORK

The primary objective of this chapter is to outline a scaling adaptation framework. This is driven by the rationale that robust strategies for expansion and institutionalization of successfully tested adaptation pilots is essential, but does not happen often. As a result, effective good adaptation practices and associated activities learned from pilots remain underutilized. The authors intend for the availability of this comprehensive framework to help expand good practices for wider benefits.

Scaling can be defined as "increasing [the] scope or reach of an activity, program, project, or initiative so that it serves more people or delivers more or better benefits" (WRI 2008). Serving more people and delivering more benefits entails transitioning from small to large impacts and, often, influencing policy reform (World Bank 2003). Scaling involves expanding, replicating, adapting, and sustaining successful projects, programs, and/or policies over time in a geographic space so that they have a greater development impact (Hartmann and Linn 2007). The key is to have multiplier effects that influence policies, reforms, institutions, and leaders, leading to greater change on the ground.

Development practitioners, especially in the health and education fields, have studied how activities in these fields can be scaled to benefit many people across geographies. Most scaling literature in development focuses on the conditions that drive scaling. For instance, the need for leadership and incentives, and the alignment of political and financial support for scaling in a decentralized governance system have been identified as conditions that enable scaling (Binswanger and Aiyar 2003; Hartmann and Linn 2007; Linn 2012). Some practitioners suggest also that community-driven scaling is a key condition for scaling (Binswanger-Mkhize and de Regt 2012).

Development literature also discusses pathways by which an activity can be scaled from the local or community to the national level and back to the local or community level, to spread benefits across scales and to reform policy (UNDP 2013; WHO 2010). The World Bank (2003) offers a useful way to assess the stage of scaling that helps identify whether a project is at a pilot stage that shows little benefits, or at a policy principle stage where the project shows many benefits and can reform policy. Focusing on the sector-wide approach to scaling, Bhushan et. al (2004) emphasize the role of partnerships in lowering transaction costs and argue for a gradual scaling process which is built around the proven capacity of local stakeholders.

Though the development literature offers useful insights on scaling, thus far the stages, conditions, and pathways of scaling identified in the development field have not been applied to adaptation projects to help understand the scaling process better. Given the current focus on adaptation to climate change, there are a significant and growing number of adaptation pilot projects implemented across geographies that have potential for scaling. However, project implementers, policy makers, and funding agencies do not have a full understanding of how adaptation projects can be scaled because of the lack of a coherent diagnostic framework.

To address this gap the authors have developed a framework, drawing on the existing development literature discussed earlier and focusing on critical components like stages, conditions, and pathways of scaling that could be applied to adaptation projects. While developing an adaptation scaling framework, the authors incorporated issues and parameters that are not necessarily dealt with in typical development-related scaling frameworks and interventions. The framework on scaling is very specific to adaptation and incorporates issues such as climate vulnerability and uncertainty (Adger et al. 2005; Ranger 2013), as well as climate trends and climate information services (Sterrett 2011). Therefore, the framework presented in this report is unique because it builds on the scaling efforts in development and incorporates elements specific to adaptation. The framework focuses on ensuring good practice and provides a way for project implementers, policy makers, and funding agencies to understand the process of scaling adaptation projects. Potential applications of the framework are as follows:

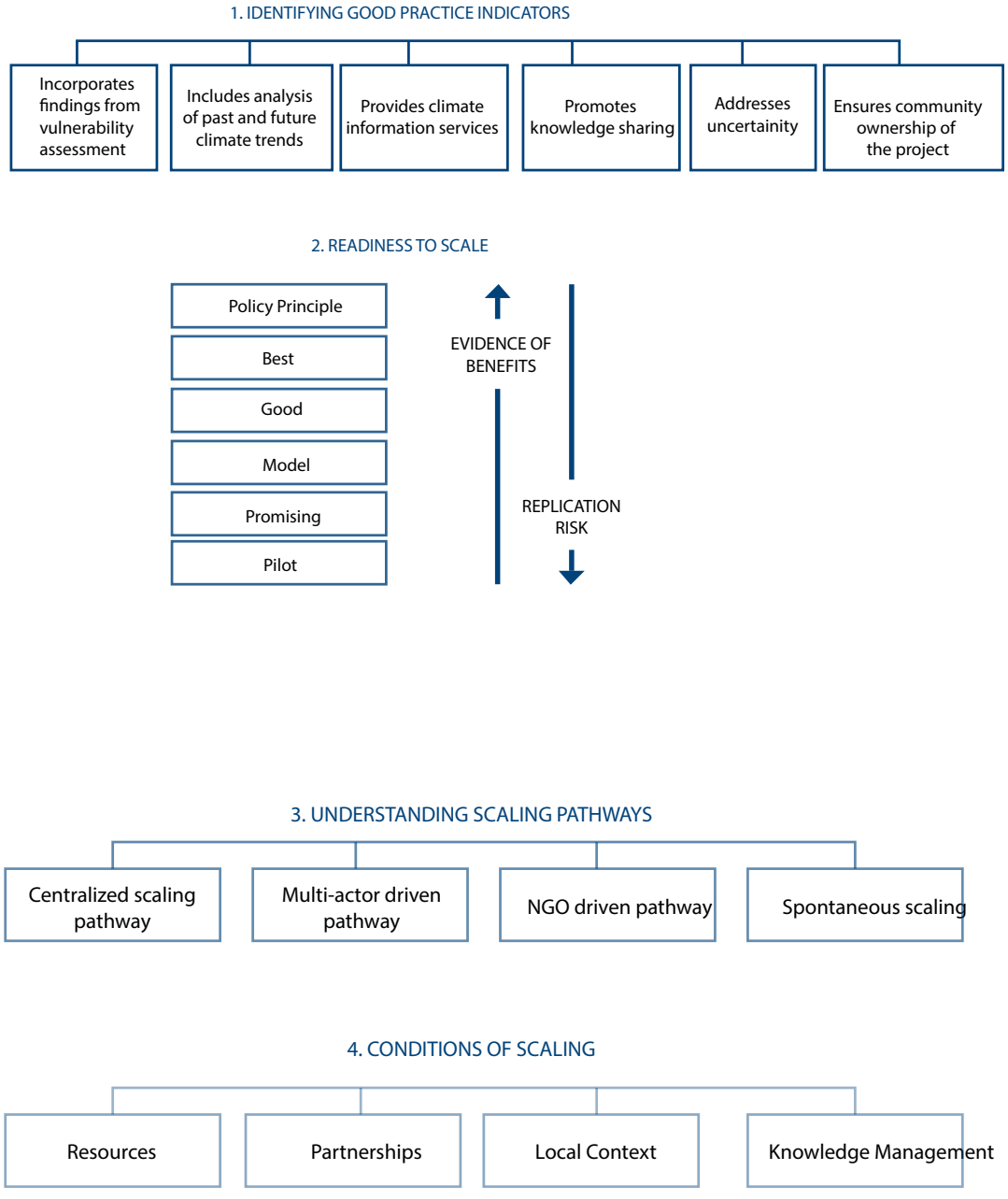
- Policy makers, project implementers, funding agencies, and others can use the framework to examine an existing adaptation project to evaluate its prospects for scaling in the future.
- Project implementers could use the framework during project design to build scaling potential, or even a specific pathway, into a new project from the beginning.
- Policy makers can use this framework to inform the development of policies or programs that support scaling of adaptation activities, or to accelerate the scaling of adaptation by modifying existing policies or programs.
- Likewise, funding agencies can use the framework to design investment initiatives or to assess projects that seek funding, so that investments are more likely to provide a maximum adaptation benefit.

The framework is divided into four parts.

- **Good practice indicators**: The first part is a preliminary assessment of whether the adaptation project demonstrates indicators of good adaptation practice (see section 2.1).
- **Scaling readiness**: The second part of the framework focuses on assessing whether there is enough evidence that the adaptation activity benefits many people and examines the level of risk (i.e. risk of failure to scale) when moving from a pilot stage to the subsequent stage of scaling (see section 2.2).
- **Scaling pathways**: The third part of the framework presents four common pathways through which scaling may occur. The four pathways provide examples of how development activities have successfully scaled (see section 2.3).
- **Conditions for scaling**: The fourth part of the framework focuses on the conditions that may affect scaling (see section 2.4).

Figure 1 depicts the four parts of the framework, which are explained in detail in sections 2.1 to 2.4.

Figure 1 | Adaptation Scaling Framework



2.1 What Are the Indicators of Good Adaptation Practice?

This report defines good adaptation practices as processes or methodologies that have been acknowledged to provide benefits within the realm of adaptation project execution. However, consensus about what constitutes a "good" practice for adaptation is continually evolving (Annex A). There are primarily four challenges in identifying outcome-oriented good adaptation practices. First, adaptation is context-specific, and activities deployed may vary from situation to situation. For instance, in one context, growing drought-resistant crops could be an appropriate adaptation activity, but in another, migration to the city could be an adaptation activity. Comparing the two to determine which a "good adaptation practice" is not useful.

The second challenge, closely related to the first, is that climate change is inherently a long-term challenge and not a one-time event. This means that, to fully assess success, adaptation activities must be tracked over decades. However, at present most adaptation efforts are rarely monitored beyond five years, so evidence of effectiveness is lacking (Dinshaw et al. 2014).

The third challenge in identifying good adaptation practices is that despite improved climate projections, climate impacts are still uncertain, making it difficult to know whether adaptation efforts will be successful in the future; often, it is unclear what future scenario to plan for (Ranger 2013).

Finally, it is difficult to ascertain when a reduction in vulnerability or an increase in adaptability is due to an adaptation project, and when it is the result of another change in circumstances. In other words, attributing adaptation benefits to a particular activity is not always a clear-cut exercise.

Despite these challenges, identifying elements of a good adaptation practice is an important exercise. Climate change is already taking place, and its impacts are causing difficulties for vulnerable people. If people wait to take large-scale action until decades of evidence has accumulated regarding what works in adaptation, it will be too late to avoid the impacts of climate change. Adaptation, therefore, is a matter of "learning by doing," including doing our best to identify good practices now, even though the challenges make it difficult to do this on the basis of strong evidence around ultimate outcomes.

BOX 1 | DEFINITIONS OF TERMS IN THE REPORT

Good practice: A process or methodology for which there is consensus that it is beneficial. The definition of good adaptation is evolving because of various challenges in defining adaptation success.

Adaptation activities: Actions taken to enhance adaptive capacities of both human and natural ecosystems through projects.

Adaptation projects: A set of time-bound activities designed to produce a unique product, service, or result that will reduce the vulnerability of farmers to climate change.

Scaling: Expanding, replicating, adapting, and sustaining successful projects, programs, and/or policies over time in a geographic space for greater benefits and impacts.

Readiness: Whether a project or an activity in a project is set to move from the pilot stage to something that will create a greater impact, including policy reform.

This report proposes a set of good practice indicators based upon a literature review that examined lessons from experiences to date with adaptation activities. As lessons thus far have necessarily focused more on the process of adaptation than on its ultimate outcomes, the six indicators presented here do not guarantee that a "good practice" activity will result in a successful outcome. Furthermore, not every indicator will be relevant to every adaptation practice. Nevertheless, these indicators together provide a starting point for identifying good adaptation practices. The indicators are as follows:

- ***Incorporates findings from vulnerability assessments***. Vulnerability assessments gauge exposure and sensitivity to social, economic, and natural vulnerabilities within a system and a given context. The results of the assessment should inform the design of adaptation projects so that they reduce vulnerability over time.

- ***Incorporates analysis of past and future climate trends***. In order to plan for long-term climate change, adaptation

planners should integrate data and information on both past and future climate trends into the design of adaptation projects. This is often integrated through a vulnerability, risk, or impacts assessment.

- ***Provides climate information services***. While not appropriate for every adaptation project, climate information services, such as weather advisories, can help beneficiaries make informed decisions. This is especially true for the agricultural activities of people in rainfed areas of India.

- ***Promotes knowledge sharing***. Iterative learning is central to adaptation and enables practitioners to adjust and improve their activities as circumstances change or new information becomes available. Feedback loops within the project help modify the project as it scales and ensure that activities are successfully adapted to new contexts. Such iterative improvement often relies on monitoring and evaluation (M&E) systems. Meanwhile, knowledge sharing among institutions and projects enables further scaling of adaptation practice.

- ***Addresses uncertainty***. To respond to the high degree of uncertainty associated with climate impacts, adaptation practices should be flexible in responding to changing needs and robust under various uncertain conditions (Adger et al. 2005; Sterrett 2011).

- ***Ensures community ownership of the project***. Adaptation literature indicates that if the community in which the adaptation activity will be implemented does not participate in its design, it will be difficult for the activity to be successful (Sterrett 2011). Equitable participation by local communities helps adaptation activities to become sustainable and relevant to the context in which they are applied (Adger et al. 2005).

2.2 Is the Adaptation Activity Ready for Scaling?

"Readiness" refers to whether an activity is set to move from the pilot stage to something that will create a greater impact, including policy reform. An adaptation activity has a greater chance of being successfully scaled if it is supported by clear evidence that the activity is beneficial.

However, as noted earlier, four challenges get in the way of assessing the benefits of an adaptation project vis-à-vis climate change. As time progresses, methods for evaluating the benefits of adaptation activities are improving, and more evaluations are being done, so evidence for what is good (which is one aspect of readiness to scale) is becoming easier to obtain.

Readiness for scaling is also affected by the risk that an activity might not successfully replicate. This idea of "replication risk" reflects the fact that some activities may be harder to scale than others, depending on the nature of the activity and its applicability to various socio-economic and political contexts. The replication risk is also determined by the level of evidence available to indicate that an activity creates benefits. If there is a high level of evidence that an activity benefits many people and can be replicated in different geographies, then the risk of not replicating will be low and linear.

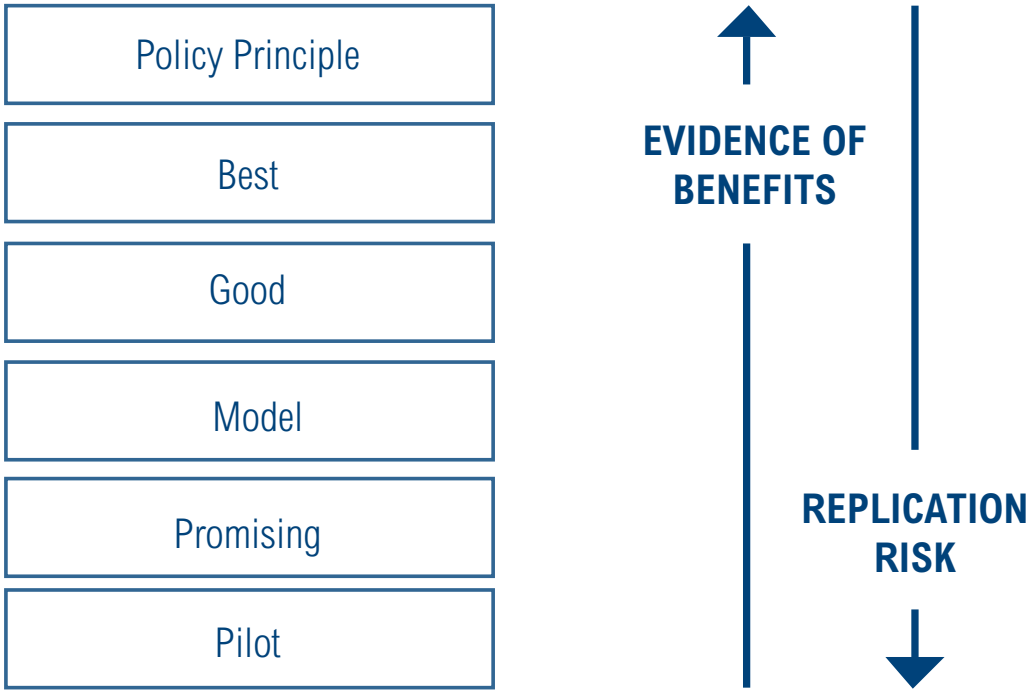
Figure 2 shows six stages of scaling and their relationship to levels of evidence and replication risk. The World Bank (2003) provides a continuum of scaling readiness, from "pilot" to "policy principle" with four stages in between. Projects can move along this continuum toward greater scale depending on two factors: evidence that the project activities are beneficial; and decreasing risks associated with scaling. These two factors are inversely related; as evidence of benefit increases, the risks associated with replication decrease, and projects are more able and likely to achieve scale.

Not all projects go through each of the stages. The transition between stages depends on the particular path the scaling process takes, the interaction between actors involved in the scaling process, and the conditions under which scaling occurs. The progression from a pilot to a policy principle may not always be rigid and linear. A project can jump from one stage to another in a non-linear fashion if there is enough support to do so. The stages of scaling readiness are further explained in Annex A.

2.3 What Scaling Pathways are Possible?

Horizontal scaling occurs when a project replicates across people and geographies (Hartmann and Linn 2007; Linn 2012).

Figure 2 | **Readiness to Scale**



However, this process is not only about copying an activity or project from one location to another; it involves adaptation, modification, and improvement of an activity or project before it is replicated (Steele et al. 2008).

Vertical scaling leads to changes in policies and legislation at the national, regional or local level (Hartmann and Linn 2007; Linn 2012). Vertical scaling, also known as political scaling (Uvin 1995), occurs when a project transitions from a small, local-level project to national and international levels. Vertical scaling can also happen when lessons learned from a project by an actor, such as a non-governmental organization (NGO), are directly shared with policy makers to influence policy reform regardless of whether the project transitioned from a small to a large project first. Alternatively, vertical scaling can occur when projects designed at the national level by the national government influence action at the local level.

There is a complex relationship between horizontal and vertical scaling. In some cases, a project will scale vertically from the local to the national level only if it is first horizontally replicated. In other words, horizontal scaling may first need to demonstrate the replicability of adaptation activities that benefit many and the subsequent need for institutional support and policy change (UNDP 2013). The process is rarely linear but is instead based on interactions between vertical and horizontal scaling (Linn 2012).

This section presents four common scaling pathways.

- Centralized scaling begins with action by a central government actor.
- Multi-actor scaling, as its name implies, is driven by multiple actors. For example, this pathway might start with the actions of an NGO but also requires engagement from the government and individual farmers before scale is achieved.
- NGO-driven scaling typically starts at the local level. It may entail singular expansion by a single NGO or decentralized replication by several NGOs.
- Spontaneous scaling occurs when individuals replicate an innovation or practice informally and without deliberate guidance from formal actors such as the government or an NGO.

More detailed examples of the common scaling pathways can be found in Annex A. The case

studies we selected follow all the pathways except for the spontaneous pathway because the cases examined formally and deliberately try to scale activities.

2.4 What Conditions Act as Enabling Factors or Barriers for Scaling?

A variety of conditions shape the scaling process in any given situation. These conditions have both positive and negative impacts on the scaling process. The scaling conditions are more often categorized by the following:

- Resources: Availability of financial resources and the institutional capacity of project staff to support scaling as the project grows are critical for scaling (Hartmann and Linn 2007; Uvin 1995). Time is also a critical resource because it could take decades for an activity to scale (Hartmann and Linn 2007). However, help of technologies, which are considered a resource, could diffuse knowledge about adaptation and save time required for scaling (Jat et al. 2012).

- Partnerships: Partnerships among government agencies that have the reach and finances to support scaling, NGOs that have a strong link to communities where adaptation projects are located, and private companies that can also finance and help scale adaptation interventions through their networks are critical for scaling adaptation activities (Reid and Schipper 2014).

- Local context: Cultural context can affect scaling. For instance, in some parts of India, the caste system does not allow project beneficiaries to equally benefit from an adaptation activity. In order to scale activities, local and community-driven approaches have better outcomes (Binswanger-Mkhize and Rget 2012).

- Knowledge management: M&E systems can help assess if a project is scaling according to plan and identify areas where the project needs to be modified to ensure successful scaling (Linn 2012). M&E systems can help capture lessons learned on scaling while helping to understand the climate and socio-economic uncertainties that the project may face as it scales over time. Lessons learned from M&E systems can be shared informally through strong partnerships and networks between institutions, or formally through knowledge exchange platforms where stakeholders from different scales meet (Stott and Huq 2014).

The conditions that affect scaling are drawn from the literature and from the interviews conducted during the course of this research. Further details on the conditions can be found in Annex A. The conditions discussed here primarily relate to centralized, multi-actor, and NGO-driven scaling. However, conditions such as networks and local context may also be applicable to spontaneous scaling. The conditions can act as either barriers or enabling factors, depending on the adaptation project. For instance, finances are required for scaling. Having finances is an enabling factor and not having enough finances can act as a barrier to scaling. Furthermore, in some cases, some conditions may play a stronger role than others. For instance, if there is funding for scaling but no community support, scaling may not take place easily.

The list is not exhaustive, but instead points to the multiple factors that can influence horizontal and vertical scaling. The extent to which a condition is prevalent depends on the context. Therefore, it is not possible to determine if one type of condition is more influential than another. However, the interplay between these conditions influences the extent to which scaling can occur.

The scaling adaptation framework presented in this chapter is central to the design of this study, and the elements of the framework are applied to assess the case studies. The interview questionnaire was designed based on (i) indicators of good adaptation practice and (ii) conditions that could impact scaling; these were the two central elements of the framework used to elicit information from the twenty-one projects through the respective respondents (see Annex B for a detailed description of the methodology followed in selecting and studying projects). Questions were designed to elicit data on the types of activities that projects are engaged in on the ground and to capture scaling experiences (see Annex C for a list of interviewees and Annex D for the questionnaire). Of the twenty-one projects reviewed, four projects were selected for further investigation. The four projects were chosen based on criteria described in Chapter 4 and Annex B. Interviews conducted with the project managers in the four projects focused on understanding if the project was ready to be scaled (part 2 of the framework), the pathways taken to scale (part 3 of the framework), and a deeper understanding of the conditions that affected scaling (part 4 of the framework).

CHAPTER 3

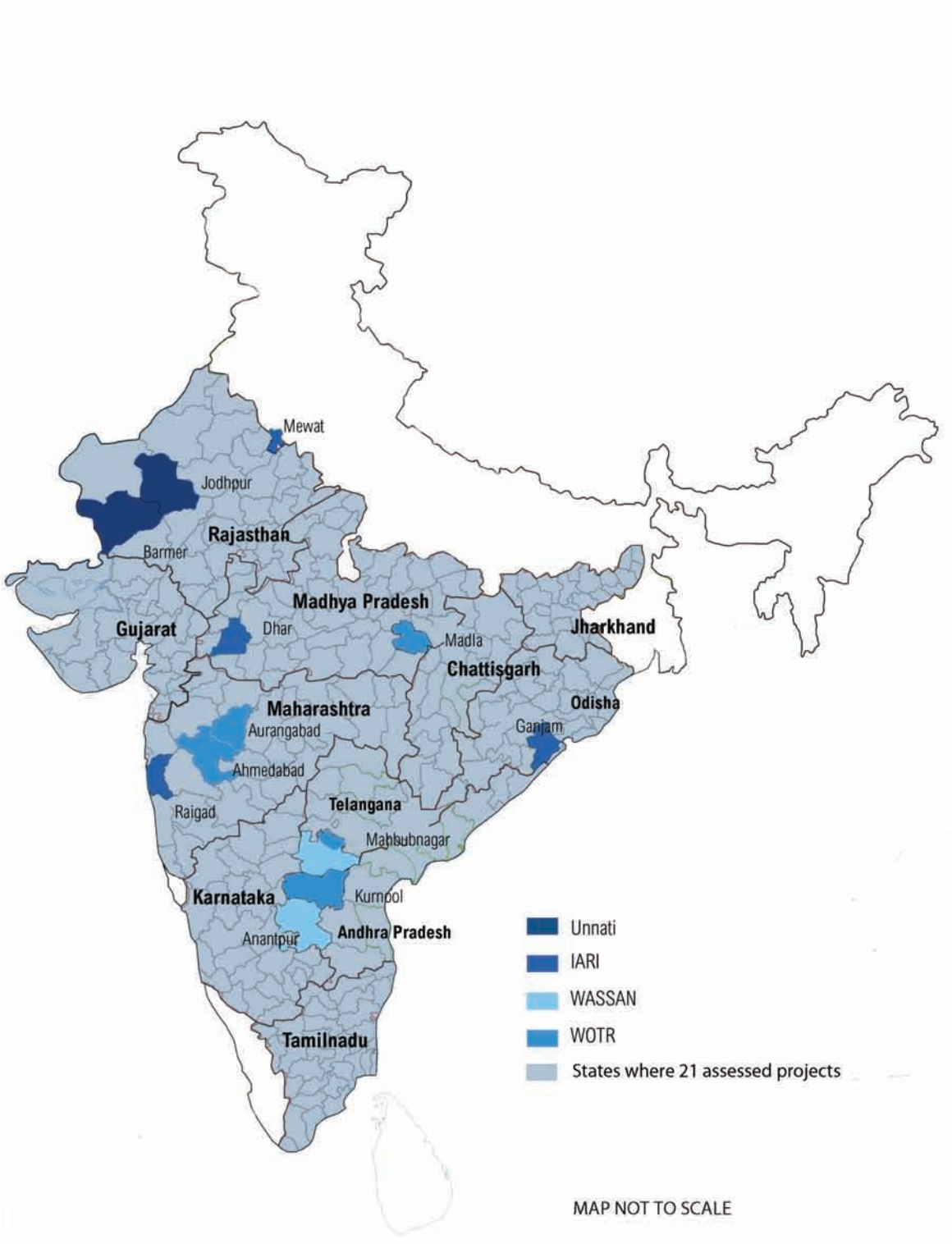
SCALING ADAPTATION ACTIVITIES IN RAINFED INDIA: AN OVERVIEW

To better understand the current set of adaptation activities in the rainfed regions of India, the authors first undertook a literature review of the various adaptation interventions currently underway in the arid and semi-arid areas of India by using secondary sources. Based on expert judgment, the authors identified five categories of agricultural activities to classify the findings from the literature (see Annex B).

To better understand the prospects of scaling adaptation activities from their current level, the authors then interviewed the implementers of twenty-one adaptation projects in rainfed regions.

This chapter focuses on the findings from the twenty-one projects that address indicators of good adaptation (part 1 of the framework) and conditions for scaling (part 4 of the framework). The twenty-one projects are spread across eleven states. Map 1 indicates the Indian states with rainfed arid and semi-arid regions in which the projects assessed in this report operate. In addition, the map highlights the twelve districts which are part of the case study projects discussed in Chapter 4.

Map 1 | **States in Which the Study Projects are Located**



3.1. Assessment of Projects by Indicators of Good Adaptation Practice

The experiences of the twenty-one projects assessed for this study show that incorporating the six good practice indicators enables projects to better plan adaptation interventions. The indicators also help projects to provide knowledge and support to implementing partners and beneficiaries, and to identify proven field-based activities for implementation. For example, the NGO Unnati conducted a vulnerability assessment prior to implementation, which enabled it to design interventions which could be easily adopted by the beneficiaries.

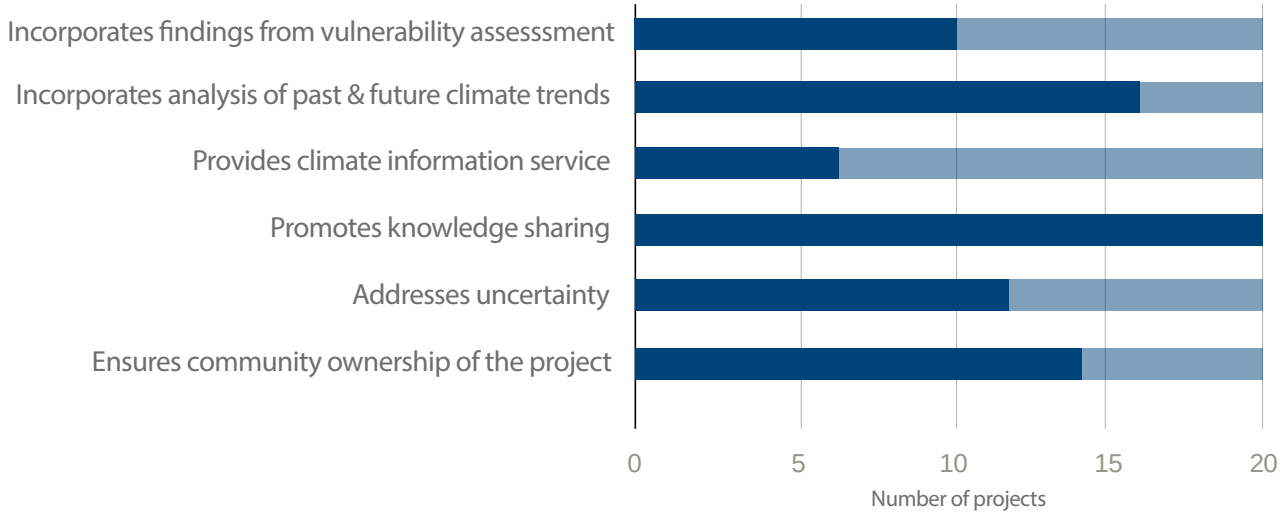
Annex H shows the extent to which the twenty-one projects reviewed incorporated the good practice indicators into their adaptation projects. Knowledge sharing and analysis of past and future climate are the most common indicators of good practice adopted across the twenty-one projects, followed by community ownership of the project. Organizations interviewed, such as the Watershed Organisation Trust (WOTR), Watershed Support Services and Activities Network (WASSAN), Indian Agricultural Research Institute (IARI), World Wide Fund for Nature (WWF), and Commonwealth Scientific and Industrial Research Organisation (CSIRO), work on all the indicators to varying degrees. These organizations are presently in a position to work on all indicators after years of experience and capacity building on adaptation.

According to the organizations interviewed, knowledge sharing, capacity building, and community ownership have been part of the agriculture discourse for four decades. However, the addition of vulnerability assessment, climate analysis, and climate information services has made a considerable positive impact on the agriculture development discourse. Figure 3 shows how many projects showed indicators of good adaptation practice.

The interviews with twenty-one projects give the following insights into the indicators of good adaptation practice.

Incorporating findings from vulnerability assessments: The interviews suggest that some projects undertake vulnerability assessments that are specific to potential climate change impacts, while others undertake more general household livelihood assessments or needs assessments. Five of the ten projects assessing vulnerability emphasized the assessment in the project plan. For instance, GIZ, in its project "Climate Change Adaptation in Rural Areas of India—Climate Proofing of Watersheds," began with a vulnerability assessment (socio-economic assessment, livelihood study, and study of climatic and non-climatic stresses) to prioritize adaptation options and interventions.

Figure 3 | **Distribution of Indicators of Good Practice Across Projects**



Incorporating analysis of past and future climate trends: Half the projects reviewed incorporated climate analysis, including climate and crop modeling, and past, present, and future climate trend scenarios. These projects then applied this information to their design and choice of interventions. Some projects focused more strongly on climate analysis than others, while some did not incorporate it at all. Typically, the larger, better-funded organizations have the financial and human capacity to undertake climate analysis. In its "Thirsty Crops" project, a responsible cropping initiative, WWF used climate analysis to understand the impacts of climatic factors like rainfall, temperature, and humidity on crop growth. In addition, it studied the demand and supply of surface water and groundwater to help beneficiaries plan their crop and irrigation cycles. Studying soil and atmospheric moisture content has also helped WWF to plan against pest attacks. Australia's CSIRO emphasized climate analysis of short- and mid-term variations in a project spread across four countries. The project works with the farmers to build their capacity to collect and visualize climate data from automated weather stations, increasing their capacity for decision making in the process.

Providing climate information services: Few of the organizations interviewed undertook climate information service provision. This may be because it requires high capital inputs and strong support systems. There are different forms of climate information service provision, ranging from technologically based service provision to training farmers to collect information from automated weather stations and interpreting and utilizing it in decision making. Technologically based services include mobile phone services and these typically require a public–private partnership, which can be challenging to establish. Action for Social Advancement, an NGO working with smallholder farmers, provides weather and related agro-advisory services to subscribing farmers. The mobile service provides information on regional weather data and crop, pest, soil, and water advice specific to the crop grown by the farmer.

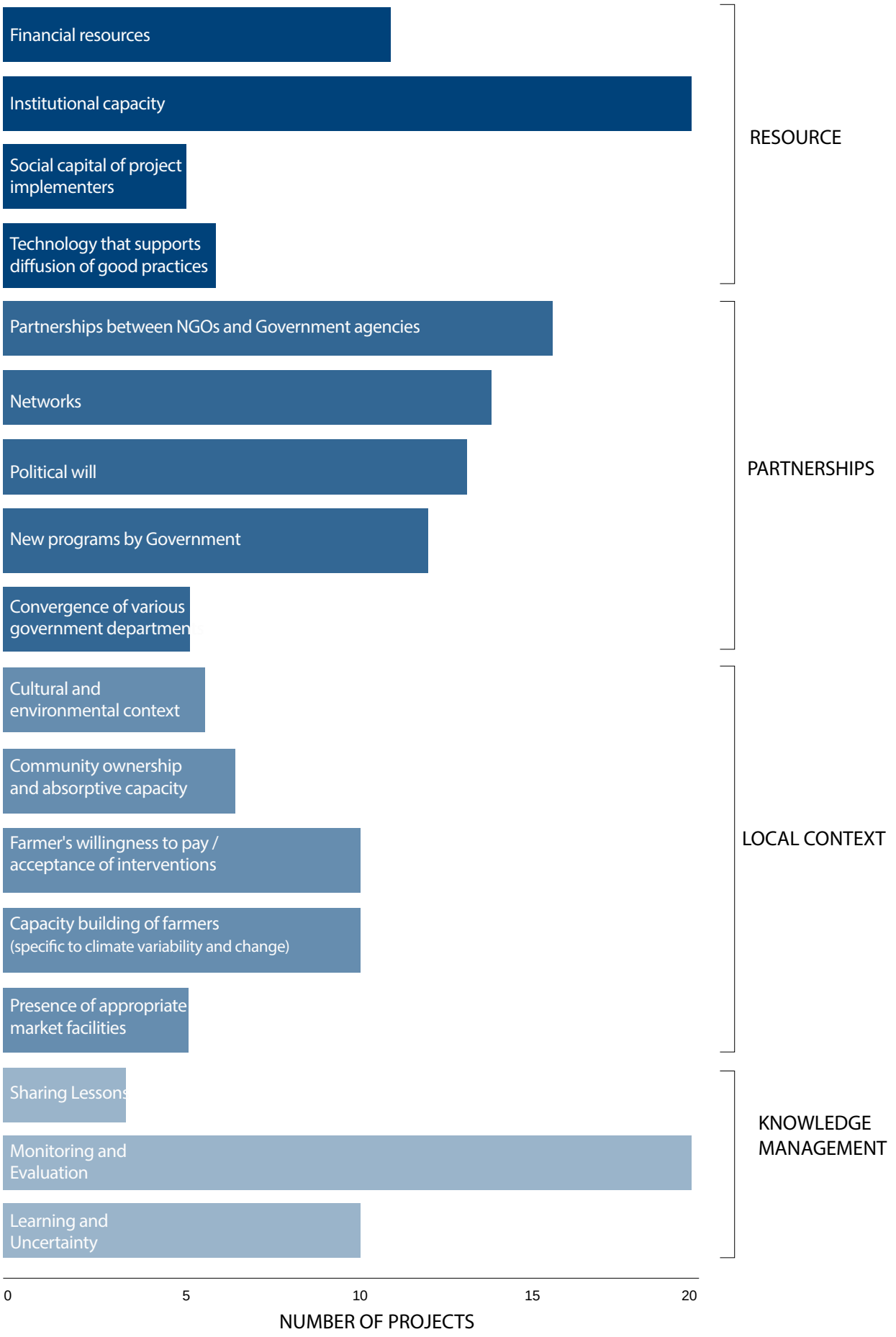
Promoting knowledge sharing: Almost all the organizations interviewed focused strongly on knowledge sharing. Knowledge sharing ranged from community mobilization to directly informing national policies and schemes, sharing knowledge with local populations through workshops, and integrating lessons learned

into online knowledge platforms. Development Alternatives has set up a "Bundelkhand Knowledge Platform," where information from ongoing projects is shared with farmers, local NGOs, gram panchayats,[2] and state government agencies. The platform has even helped farmers who are not direct beneficiaries of the project to adopt new technologies and techniques. The platform informs farmers about government schemes and encourages indigenous seed culture. Action for Food Production, a national NGO, has presented its experience with building brick- or concrete-lined irrigation channels in Rajasthan to the central government. The improved irrigation schemes reduced water loss during transport in a water-scarce region and provided additional livelihood opportunities in the area.

Addressing uncertainty: To benefit from adaptation projects over the long term, beneficiaries need the capacity to apply information and make decisions under uncertain climatic conditions. Action for Social Advancement has been instrumental in developing and using the "Responsible Cropping Initiative" software, which helped to build the capacity at the grassroots level to maximize benefits of the project. The software inputs data from beneficiary farmers on farm location, fertilizers, composting, pesticides, insecticides, weedicides, crop/seed variety, sowing and cutting, soil type, equipment, livestock, irrigation source and type, ploughing methods, and past production. It then analyzes productivity changes, the benefits accrued by farmers, input costs, and earnings. The analysis helps farmers make informed decisions during the next crop cycle. The software also tracks the training programs attended by each farmer. In the CSIRO project, stakeholder engagement is carefully designed to suit the local context. The project relies on a knowledge management team that is responsible for developing communication strategies and packages to inform and engage stakeholders. These activities are supported with a dedicated fund.

Ensuring community ownership of the project: Implementers noted that if the technologies, techniques, and physical assets they develop are not co-owned by the beneficiaries, the intervention's sustainability becomes uncertain. In the projects reviewed, ownership appears to increase the chances of a project being successful and sustained over long term. For instance, when the beneficiaries are unable to

Figure 4 | **Assessment Summary of Scaling Conditions in the Studied Projects**



co-finance interventions, implementers use their time and labor to encourage ownership and this contributes to the success and sustenance of the projects. The Centre for Environment Education, under its program "Gram Nidhi," has created sustainable finance options for eco-enterprises with a revolving fund. Donor agencies, village institutions, and beneficiaries have all supported the fund, which has been operational for more than ten years now. WOTR forms groups of villagers (known as Wasundhara Sevaks) to cultivate community ownership at the grassroots level. The Wasundhara Sevaks are engaged in a variety of project implementing activities. The groups encourage youth and women to raise awareness on water budgeting, maintaining automated weather stations, and preparing biodiversity registers. Community engagement in these activities have been observed to build the much-needed social capital to sustain the resources, while also promoting ownership of the structures needed for the project to operate continuously.

3.2 Assessment of Projects by Scaling Conditions

Figure 4 shows which scaling conditions influenced the scaling experience in the twenty-one projects reviewed for this report. The trends are as follows:

- The interviewees revealed that the most critical condition to effect scaling would be the availability of dedicated communication systems focused on scaling an activity within an organization and between partners and other relevant stakeholders.
- Another significant factor that affects scaling is human resources. This suggests that institutional capacity within the organization is critical to scaling a project and/or activity.
- Other factors like demand for expansion, M&E, and partnerships affect scaling moderately. The interviewers observed that the projects which did not have M&E built into them were less likely or able to scale. Thus, without standardized M&E built into the projects it is increasingly difficult to achieve scaling objectives.
- Social capital of the implementers is an important condition to scale. However, as seen in Figure 4, very few organizations design the projects to accommodate this particular element.
- Projects that are not funded by the government have a difficult time finding donors to fund large-scale undertaking. Thus, availability of finance, especially for scaling, is a major concern for many organizations.
- Among local conditions, community ownership and farmers' willingness to pay are major conditions that affect scaling. These were considered to be the building blocks of any project by interviewees. If these two conditions are not met the project may not succeed, let alone scale.
- When asked about the demand for scaling their work, interviewees reported a range: in some cases there was no demand, while in other cases demand was high. Sources of demand ranged from state governments to banks, international NGOs, research institutions, and villagers.
- Several interviewees mentioned trying to integrate their efforts into existing schemes and government programs and policies. Most interviewees inform policy makers of their findings and make recommendations through direct contact or workshops, or by planning processes already underway.
- A few interviewees highlighted the need to build the capacity of farmers and local communities to absorb the new interventions.
- Finally, in terms of uncertainties that can inhibit scaling efforts, the interviewees' answers varied to include political instability, climate variability, and uncertainty of policy outcomes.

The interviews with the twenty-one projects give the following insights into the presence or absence of scaling conditions. Annex H presents a comprehensive depiction of the twenty-one projects' activities and indicators.

Resources: In the projects reviewed, human resources (skills) that could be used to promote scaling were more readily available than

financial resources specifically dedicated to scaling project activities. In most cases, there were adequate funds for implementing the project, and only in a few cases was funding set aside or accessible for scaling. When funding for scaling was unavailable, it was usually due to shifting priorities of funding agencies. The authors observed that half of the project studied struggled to obtain funding to scale.

Partnerships: Interviewees from sixteen out of twenty-one projects cited partnerships between NGOs and government agricultural extension agencies as critical to scaling. Several interviewees noted that local NGOs are important partners in project expansion, but also emphasized the need to partner with local and state governments for continued support over time. Universities also play an important role in scaling.

Local context: Several interviewees mentioned changing priorities among funding agencies, inconsistent support from the government, limited acceptance by the farming community, and lack of political will as contextual factors that affect the scaling potential of their projects. The presence, absence, or local government's interest in on-going projects was often cited as a limiting or enabling factor for scaling. The need for a continued presence in project villages was cited as an important factor for scaling initiatives. Limited acceptance of the project by the farming community negatively affected scaling in half of the projects, followed by lack of community ownership of the project. Social capital built by NGOs during the pilot phase of a project is considered the foundation of capacity building, which often leads to faster technology diffusion. Existing functional market facilities are helpful, especially when new crops are introduced. Implementers suggest that projects should study market facilities before introducing new crops or varieties.

Knowledge management: Sharing lessons learned is the most important enabling condition for scaling. Sixteen out of the twenty-one projects had M&E systems in place to track scaling of adaptation activities, which increases the extent to which successful scaling can occur. In certain projects, funding is not available for M&E, which makes it difficult for the implementer to assess if the interventions were successful. Some of the projects incorporating M&E looked for funding elsewhere when the initial donor did not provide sufficient funding.

CHAPTER 4

CASE STUDIES

This chapter takes a deep dive into four of the twenty-one projects reviewed for this report. In so doing, it offers insights into whether the activities in the project are ready to be scaled and, if they already scaled, what stage of scaling they are currently in.

The analysis in this chapter has been created using the scaling framework outlined in chapter 2 and described in further detail in Annex A. The case studies do not attempt to identify projects as "successes" or "failures." Rather, they present an opportunity to apply the scaling adaptation framework to real world projects. As with the other projects reviewed for this report, the information on the four case studies is drawn primarily from interviews with project managers (see Annex E for the deep dive interview questionnaire).

Six criteria guided the authors' selection of case studies.

- Whether the projects specifically focused on adaptation
- The range of stages associated with the scaling process
- The range of conditions for scaling met by the project
- Whether the project exhibited a clear scaling pathway
- The quality of the description of the project in the scoping interview
- The availability of key project personnel for a second-round of deep dive interviews

Overview of the Case Studies

Map 1 pinpoints the locations of the four case

study projects, each led by a different institution. The case studies were led by

- Watershed Support Services and Activities Network (WASSAN)
- Indian Agricultural Research Institute (IARI) and partners
- Watershed Organisation Trust (WOTR)
- Unnati

Figure 5 illustrates the application of the scaling adaptation framework set out in Chapter 2 to each of the four case studies explored in this chapter.

Figure 5 | **Overview of the Four Case Studies**

CATEGORY	WASSAN	IARI	WOTR	UNNATI
INDICATORS OF GOOD ADAPTATION PRACTICES				
Vulnerability assessment	X	X	X	X
Analysis of past and future climate trends	X	X	X	X
Provision of climate information services		X	X	
Knowledge sharing	X	X	X	X
Addresses uncertainty	X	X	X	X
Demonstrates community ownership	X	X	X	X
PATHWAYS TO SCALING				
Pilot				X
Promising				
Model	X	X	X	
Good				
Best				
Policy				
PATHWAYS TO SCALING				
Centralized scaling		X		
Multi-actor scaling	X			
NGO-driven scaling			X	X
Spontaneous scaling*				

*Spontaneous scaling occurs in all projects. It is not a specific pathway followed by the implementers; however, farmers adopt some activities without the implementers assistance

Figure 5 | **Overview of the Four Case Studies**

CATEGORY	WASSAN	IARI	WOTR	UNNATI
RESOURCES				
Financial resources	X		X	X
Institutional capacity		X	X	X
Time	X		X	X
Social capital of project implementers			X	
Technology that supports diffusion of adaptation activities	X	X	X	X
PARTNERSHIPS				
Partnerships between NGOs and Government Agencies	X	X	X	X
Public Private Partnerships	X		X	X
Networks			X	X
Convergence of various government departments	X	X	X	X
Political will	X		X	
New programmes by Government	X		X	
LOCAL CONTEXT				
Cultural and environmental context	X		X	X
Community ownership and absorptive capacity			X	
Farmer's willingness to pay/ acceptance of interventions	X	X	X	X
Capacity building of farmers (specific to climate variability and change)		X		
Presence of appropriate market facilities	X		X	X
KNOWLEDGE MANAGEMENT				
Sharing Lessons	X	X	X	X
Monitoring and Evaluation	X	X	X	X
Learning and Uncertainty	X	X	X	X

4.1 Watershed Support Services and Activities Network (WASSAN)

Table 1 | **Summary of WASSAN Case Study[3]**

CATEGORY	DESCRIPTION
Name of the project	Andhra Pradesh Drought Adaptation Initiative (APDAI)
Project years	Phase 1: June 2006–April 2007 Phase 2: May 2007–December 2009
Funded by	Phase 1: funded by the World Bank Phase 2: funded by the Japan Policy and Human Resources Development Fund Climate Change Initiative Grant to the Government of Andhra Pradesh, and supported by the World Bank
Consortium	■ Implementing agency: Society for Elimination of Rural Poverty ■ Lead technical agency: WASSAN ■ Supervisory role: Principal Secretary, Rural Development. An APDAI cell was set up in the Office of the Commissioner, Rural Development, Department of Rural Development, Government of Andhra Pradesh ■ Institutional support: World Bank ■ Community engagement: Members from the village were included in the development process through a complex institutional structure of self-help groups typically formed by 10–15 women.
Regional coverage	Andhra Pradesh is located in the southeastern part of India, with a population of 76 million. Around 35 million people live in its eight drought-prone districts. The pilot project was initiated in the two most drought-prone districts: Anantapur and Mahbubnagar.
Climatic stress	Anantapur district has an average rainfall of 544 mm per annum, the lowest in the state. Mahbubnagar district has the second lowest average annual rainfall in the state. These districts depend heavily on groundwater and show low productivity in crops (other than rice) and high grazing intensity, and hence are most ill-adapted to arid climatic conditions.
Non-climatic stress	Anantapur and Mahbubnagar are two of the poorest districts in the state. Agriculture is the highest contributing sector to the gross domestic product and employs a high percentage of the workforce.
Activities	■ Crop Management □ Diversified farming systems—include crop diversification, soil improvement, and application of non-pesticide management □ Village-level seed banks □ Introduction of millet into the Government Public Distribution System ■ Soil Management □ Introduction of plough bullocks □ Nurseries ■ Farm Management □ System of rice intensification □ Common Land □ Introduction of village-level fodder banks □ Community-managed livestock vaccination service □ Development of livestock insurance system □ Leased land farming ■ Water Conservation □ Groundwater sharing However, almost all activities were related to water management since water is a scarce resource in the region ■ Pest Management □ Non-pesticide management program

CATEGORY	DESCRIPTION
Activities for scaling	19 pilot activities were initiated under the APDAI project; 10 were identified in existing or emerging structures for scaling, and five were assessed as viable for scaling in the future. Under an umbrella program called the Rainfed Land Development Program, launched by the Government of Andhra Pradesh, three activities were scaled through an institutionalized approach. These were diversified farming systems, groundwater sharing, and seed banks.
Impact of adaptation activities	The APDAI project and its ten activities that were scaled are testimony to the Government of Andhra Pradesh's intent to address its drought problem by identifying effective adaptation activities. Impacts of pilot activities were assessed based on a benefit-cost analysis included in the World Bank report The Andhra Pradesh Drought Adaptation Initiative: Lessons from Community-Based Adaptation Approaches to Strengthen Climate Resilience.

Background

The Andhra Pradesh Drought Adaptation Initiative (APDAI) project was an outcome of a 2005 World Bank study recommending a local-level strategy to reduce the impact of drought (World Bank 2011). Based on the study's recommendations, the state government launched the three-year APDAI pilot project in 2006. The pilot was one of the World Bank's first projects that looked at the impacts of climate change and resilience at the local level in India. APDAI was set up as a stand-alone pilot project in the Department of Rural Development and was institutionally linked to the World Bank-supported Andhra Pradesh Rural Poverty Reduction Program (World Bank 2011).

APDAI was able to leverage self-help groups established as part of the Andhra Pradesh Rural Poverty Reduction Program at the village, mandal, (sub-district) and district levels. Hence, all activities under APDAI were initiated through a multi-stakeholder approach, encouraging the state government and village-level organizations to work together to create ownership. The project incorporated farmers' concerns and aspirations from the outset, and built adaptive capacities by training farmers on the benefits of adopting certain "activities"[4]. Since this was the World Bank's first such project, it allowed for flexibility, ease in fund disbursals, timely technical support, and flexibility in decision making, all of which enabled easy scaling of the activities.

Scaling Pathway

The APDAI project appears to meet most of the good adaptation practice indicators described in Chapter 2 of this report[5]. The government and WASSAN are leading efforts to scale several of the project's activities through knowledge-sharing platforms. The evidence indicates that the APDAI project demonstrates the model stage of scaling[6]. Two approaches to scaling are evident in this project: a systematic institutionalized approach for horizontal scaling and a vertical approach through district-level programs, policy initiatives, and legislation.

The Rainfed Land and Development Program was specifically designed as an umbrella program to enable the consolidation and scaling of the pilot initiatives. It is an example of an institutionalized approach that allows for the merging of APDAI's pilot activities with those of the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). The Government of Andhra Pradesh fully funds the program through its start-up phase and covers an area of 24,700 acres across the project area. The three pilot activities under this program were diversified farming systems[7], seed banks, and groundwater sharing.

An example of horizontal scaling is the APDAI groundwater-sharing pilot that led to new groundwater legislation recognizing the rights of community members over groundwater. The state government is preparing a programmatic framework based on the lessons learned under APDAI to introduce the concept in the twenty-one threatened groundwater basins across the state (World Bank 2011). Moreover, the government intends to mainstream APDAI project activities across all watershed areas under its jurisdiction, and the Integrated Watershed Management Program will soon institutionalize these activities at the state level.

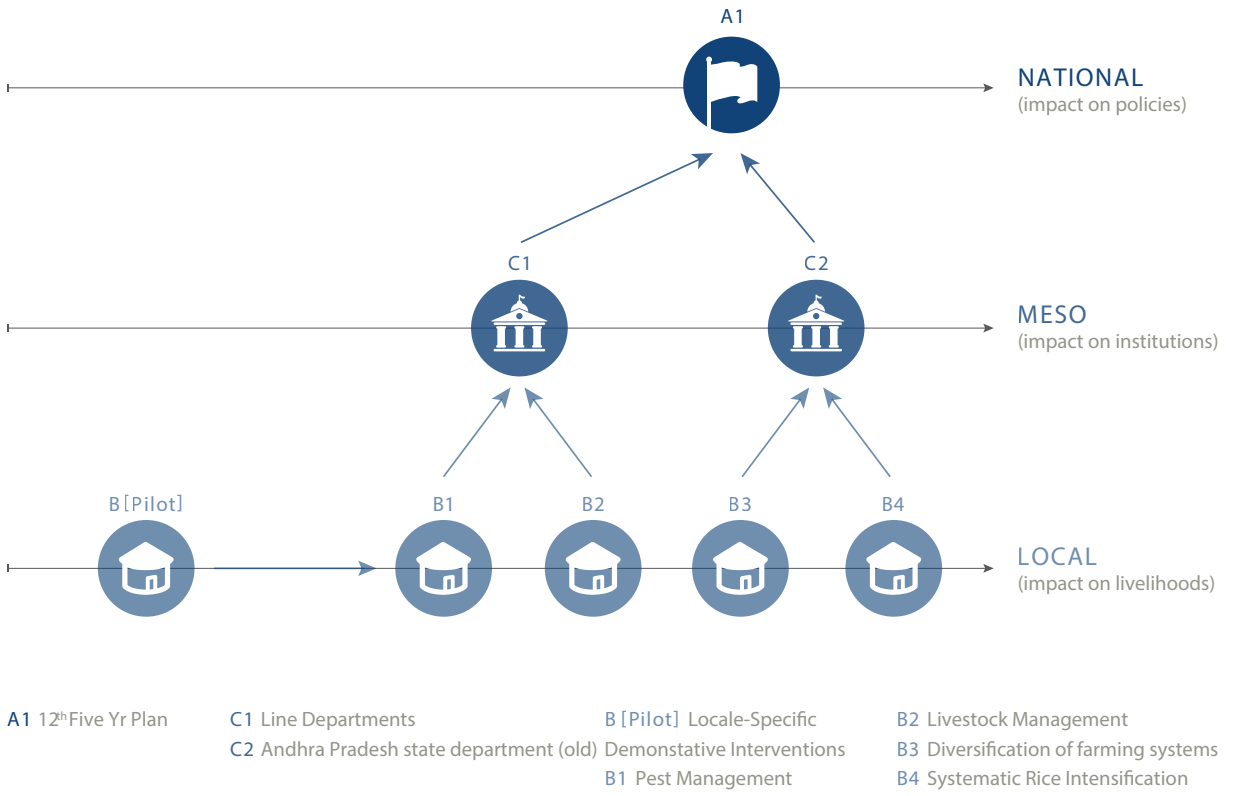
Other efforts for scaling local activities toward meso-level programs or policies are also underway (World Bank 2011).

- Organic farming, with a focus on soil moisture conservation by using diversified farming systems and systematic rice intensification techniques for responsible water utilization.
- Increasing biomass production through activities such as non-pesticide management and tree-based farming, developing nurseries that will be scaled by the Society for Elimination of Rural Poverty with support from the National Rural Employment Guarantee Scheme.
- Bringing degraded uncultivated land under cultivation through another umbrella program: the Comprehensive Land Development Project. The National Bank for Agriculture and Rural Development (NABARD) and the National Rural Employment Guarantee Scheme supported the initiation of project activities.

APDAI's scaling pathway is not typical of NGO-driven scaling; instead, it is an example of multi-actor scaling. Figure 3 illustrates the scaling pathway and is based on interviews with A. Ravindra from WASSAN. NGO partners working with farmers to improve their livelihoods and adaptive capacities implemented these pilot activities (B). Farmers from neighboring villages (non-beneficiaries) took up some of APDAI's pilot activities (B1 and B2) to cope with existing conditions; while some activities (B3 and B4) were taken up for horizontal and vertical scaling by the state government under more institutionalized approaches.

Scaling pathways were designed into the process of the project; line departments and other state-level organizations (C1 & C2) periodically visited project sites at various stages of implementation. This not only built credibility with state officials, but also brought in the importance of setting up grassroots structures for effective implementation of the project activities. State-level departments have been responsive in integrating lessons from APDAI and informing the Planning Commission (A1), and these have contributed to the Twelfth Five Year Plan.

Figure 6. | **Scaling pathway led by WASSAN**



APDAI effectively reduced vulnerability to drought through cost-effective and community-driven activities in the pilot site[8]. The operational strategy developed for APDAI includes not only disseminating technologies, but also sharing lessons learned from the pilot initiative toward the scaling process[5]. At the core of the approach is a strong inclination toward generating demand for adaptation initiatives among communities by establishing the necessary institutional mechanisms to support adaptation activities.

Conditions for Scaling

WASSAN uses a systems approach, setting up mechanisms with an inherent potential for scaling both horizontally and vertically[5]. The pilot project strategy was based on two considerations: a dual focus on natural resource management while ensuring economic opportunities, and developing responses to a changing climate for both positive and negative conditions, ensuring a systematic response to uncertainty (World Bank 2011). Most of the projects use a holistic approach that addresses not only a specific activity, but also associated systems and mechanisms for long-term sustainability of the initiative3 According to the project implementer, sustained flow of funds and learnings from extreme condition field experiences are critical to scale pilots and adaptation activities. The study identifies the following factors as significant means for scaling.

Short-term and long-term funding availability: Two general types of financial support are required for scaling. First, intensive investments are needed for systems to spread to larger areas. The government often allocates these funds. Second, funds are needed to facilitate research; this funding gap is seldom covered[5]. For the APDAI initiative, funds were available for pilot activities: the World Bank provided funding for facilitation and implementation in the five project villages (World Bank 2011). However, no funding was allocated specifically for expansion[5]. It is important to design project activities as embedded within existing or emerging government operations or policy initiatives. This will ensure financial mechanisms are available for the long-term sustainability of project activities (World Bank 2011).

Assessing village-level capacities to ensure scaling success: WASSAN identified village and mandal organizations based on their capacity to handle innovations and technical challenges. This social capital of human resources was an important indicator for site selection. Conversely, the social capital of self-help groups was a key resource for the success of pilot activities.

Multi-actor partnerships leading to successful implementation: The Society for Elimination of Rural Poverty was the implementing agency for the APDAI project and WASSAN was engaged as the lead technical agency to facilitate implementation. The Principal Secretary of Rural Development supervised the implementation process. An APDAI cell was created within the Office of the Commissioner, Rural Development, to oversee the workings of the Society for Elimination of Rural Poverty and WASSAN. The Commissioner coordinated the scaling of successful initiatives emerging from APDAI throughout the state (World Bank 2011). Existing self-help groups, formed under the Andhra Pradesh Rural Poverty Reduction Project, were leveraged to engage farmers in the development process (World Bank 2006).

Local interest and institutional capacities important resources for scaling: APDAI project activities were designed to build institutional and local capacities to better adapt to climate variability in drought-prone areas (World Bank 2011). Local-level institutions and partnerships were used effectively for horizontal scaling and replication of activities; however, farmers were engaged in the process at every stage to assess local interest. Even if some adaptation activities are cost-inefficient in the short term, governments may be willing to scale them based on local interest[5].

Sharing and collaborating project learnings across a larger network: The APDAI project led to the creation of the Revitalizing Rainfed Agriculture network to bridge a critical knowledge and advocacy gap. The Revitalizing Rainfed Agriculture network[9] was launched as a growing portal of over sixty organizations of varied nature, including donor agencies and individuals, advocating for a differentiated agricultural policy and support system for rainfed areas in India. They proposed a series of specific measures[10] as thematic nodes, each anchored by experienced member

organizations. The network serves as a research and idea portal for partner organizations, as well as a funding mechanism for experimentation and pilot project implementations. Member organizations work with other partners to support and promote climate adaptive activities that fall within a thematic node, producing key knowledge products based on their lessons learned. The network facilitates new partnerships with academic and research organizations of funding partners, to bring more attention and investment into rainfed agriculture policy and practice.

Extreme environments to be leveraged as opportunities for scaling adaptation activities: The APDAI project was pilot tested in Andhra Pradesh's two most drought-prone districts, Anantapur and Mahbubnagar. The World Bank (2011) states that these districts are highly dependent on rainfed agriculture, are ill-adapted to arid conditions, and show very low per capita income levels as compared to other rainfed districts in the state. About 11 percent of Anantapur and 20 percent of Mahbubnagar are irrigated, compared to 35 percent statewide. Over 80 percent of the irrigated lands are dependent on groundwater, compared to 47 percent at the state level pilot activities initiated here not only built local capacities to understand and manage their natural resources, but also created economic opportunities for farmers and community members (World Bank 2011).

Assessing project impacts and extracting key learnings: According to the APDAI interviewee, the project did not engage in detailed and comprehensive monitoring, evaluation, and learning processes. Project impacts were assessed at the close of the pilot activities and benefit-cost analyses were monitored. However, the analyses were based on very small sample studies and carried out over short time periods. WASSAN publications and knowledge products provide additional details on project impacts on people and ecosystems (World Bank 2011). Moreover, the technical assistance provided at the mandal level includes components on institutional development, knowledge sharing, M&Es, and program management.

Coping with climate uncertainties: Climate projections and historical data for arid areas in Andhra Pradesh indicate increasing climate variability and high degrees of uncertainty (World Bank 2011). The APDAI project has supported several pilots designed to help farmers cope with this uncertainty. For example, through the APDAI project, WASSAN has initiated several successful biomass production pilots to manage soil fertility. These enhance soil health and improve fertility and soil moisture in order to manage climate uncertainties (World Bank 2011). To increase biomass production, non-pesticide management and tree-based farming activities supported through large-scale nurseries were included. Additionally, pilots focusing on soil moisture conservation use a diversified farming systems approach, with low-water intensive cropping patterns including the system of rice intensification technique (World Bank 2011).

Creating an enabling environment for successful implementation and scaling: Demand for these adaptation activities does not always exist; it may have to be manufactured through pilot projects[5]. WASSAN develops not only the technologies for farmers, but also the processes and structures to support farmers' investments in these[5]. In addition to climate uncertainty, the successful implementation of solutions needs an enabling environment—by means of institutional and administrative capacities. Moreover, political uncertainties add to the institutional and administrative challenges impeding decision making; for example, shifts in governments and government staff can impact continuity and the scaling of pilot projects[5].

Potential for Scaling and Recommendations

According to the typology of readiness for scaling set out in the scaling framework the APDAI project is at the model stage of scaling. Several of these activities were scaled by assimilating them into existing government programs, schemes, and operations. Key lessons and recommendations that emerge from this case study are as follows:

We need a paradigm shift to move toward climate resilient agriculture. Strong leadership is required to change the paradigm for natural resource management toward climate resilience. Agriculture development projects are often framed to increase productivity. While increasing productivity is essential to reducing poverty, framing projects to focus on

sustainability, better adaptability, and effective resource management is essential to building climate resilience in villages.

Engaging community members in the planning, designing, and implementation processes is critical. Strong civil society organizations are helpful for successful adaptation, especially if they are willing to engage with community members at every stage. Intensive and inclusive dialogue with all stakeholders is important for effective adaptation to climate change.
For any activity to stand the test of time, it should probably be economically viable for the individual or group of individuals who undertake it.

Adaptation activities should account for social, cultural, and economic resilience factors. A strong synergy between natural resource management and livelihood development with a focus on diversification, conservation, and regeneration is a no-regrets approach to developing climate resilience. Technical solutions are often simple, but the challenge lies in the enabling environment, such as socio-economic conditions.

Adaptation requires well-functioning government structures willing to innovate and change. Support for drought adaptation is good government policy. MGNREGS is a powerful tool that can be leveraged to support drought adaptation.

Adopt high-risk sites to develop a comprehensive understanding of the most vulnerable communities. In order to diversify and address the needs of high-risk communities, pilot projects should include a focus on villages with very low-income levels and high levels of climate and political uncertainty. This will allow new insight into activities to emerge, there by allowing for a process of risk reduction for future scalability.

4.2 Indian Agricultural Research Institute and Partners (IARI)

The National Agricultural Innovation Project (NAIP), funded by the World Bank and the Global Environment Facility, focuses on minimizing the impacts of climatic stresses on rural livelihoods in drought- and flood-prone regions. The "Strategy to Enhance Adaptive Capacity to Climate Change in Vulnerable Regions" is a sub-project within the NAIP initiative (hereafter referred to as the NAIP sub-project). The key intent of the NAIP sub-project is to test and demonstrate available technologies and strategies for adaptation through participatory trials with farmers. IARI is the lead agency, along with four partnering organizations that form the project consortium and lead scaling of activities. The project was implemented in four districts: the drought-prone region of Mewat (Haryana) and Dhar (Madhya Pradesh), and the flash flood-prone coastal region of Raigad (Maharashtra) and Ganjam (Odisha). The design of projects with national-level coverage, like the National Initiative on Climate Resilient Agriculture (NICRA)[15] initiative, integrates lessons from the NAIP sub-project.

The analysis of gridded weather data for Mewat and Dhar districts indicated general increase in temperature and decrease in rainfall, inducing stress on rabi[16] crops. The consortium identified activities for implementation based on a series of consultations assessing farming activity, household conditions, and farmer vulnerability. To reduce the risk of crop loss, 300 small and marginalized farmers in Mewat and 250 farmers in Dhar self-selected for a climate risk-related crop intervention (World Bank-GEF 2012). Drought-tolerant seed varieties were introduced in both districts, where the major rabi crops are wheat and mustard. A preliminary evaluation of improved seed dissemination in Dhar provided some markers to increase the yield of wheat crop by about 30 percent (CESCRA 2013). As the yield of the self-selected farmers increased, the remaining farmers followed the trend by using the new seed variety. Community-managed seed banks were established to encourage local seed production to meet demand from farmers in the surrounding areas[17].

Recognizing the value of climate information provision services to minimize the weather-related risks for the farmers, the NAIP sub-project initiated "mKRISHI," a mobile phone weather information service reaching the project villages in each of the four districts through public–private partnership. This two-way interactive service between farmers and information providers has become popular in a short period. The mKRISHI pilot started with fifteen farmers but rapidly expanded to 3,000.

Table 2. | **Summary of IARI Case Study**

CATEGORY	DESCRIPTION
Name of the project	Strategy to Enhance Adaptive Capacity to Climate Change in Vulnerable Regions[11]—National Agricultural Innovation Project (NAIP)[12]
Project years	2009–2013
Funded by	Jointly funded by the World Bank and Global Environmental Fund
Consortium	■ IARI (lead institute) + NGOs ■ Central Marine Fisheries Research Institute ■ Mumbai Research Centre ■ Central Rice Research Institute ■ Orissa University of Agriculture & Technology ■ Tata Consultancy Services .
Regional coverage	Four districts: Mewat, Haryana; Dhar, Madhya Pradesh; Raigad, Maharashtra; and Ganjam, Orissa
Climatic stress	The districts of Mewat and Dhar are drought prone, with heat and soil moisture being the highest stress factor. In contrast, Raigad and Ganjam are flood prone, where crops are often submerged after flash floods.
Non-climatic stress	Food nutrition and ensuring livelihoods
Activities	■ Crop Management □ introducing drought-tolerant varieties of wheat; high-yielding variety in Dhar; flood-tolerant rice variety in Ganjam □ Integrated cropping system in the lowlands and irrigated medium land □ Village-level seed banks ■ Farm Management □ Diversification of crops □ Horti-agro □ Inter-cropping □ Integrated Farming System (IFS; agriculture + livestock + pisciculture) □ High-yield varieties □ Pest management using organic solvable ■ Agro-Weather Advisory □ mKRISHI—Weather Information Services □ Agro-advisory ■ Non-Farming □ Skill training for women to strengthen livelihood
Activities for scaling	■ Varietal replacement of drought- and flood-tolerant varieties by encouraging local seed production ■ Mobile-based agro-weather advisory and weather advisory for fisheries ■ Low input cost technologies like local seed culture, pheromone traps, and shared inventory of equipment ■ IFS as an activity ■ Non-farm based activities like skill training

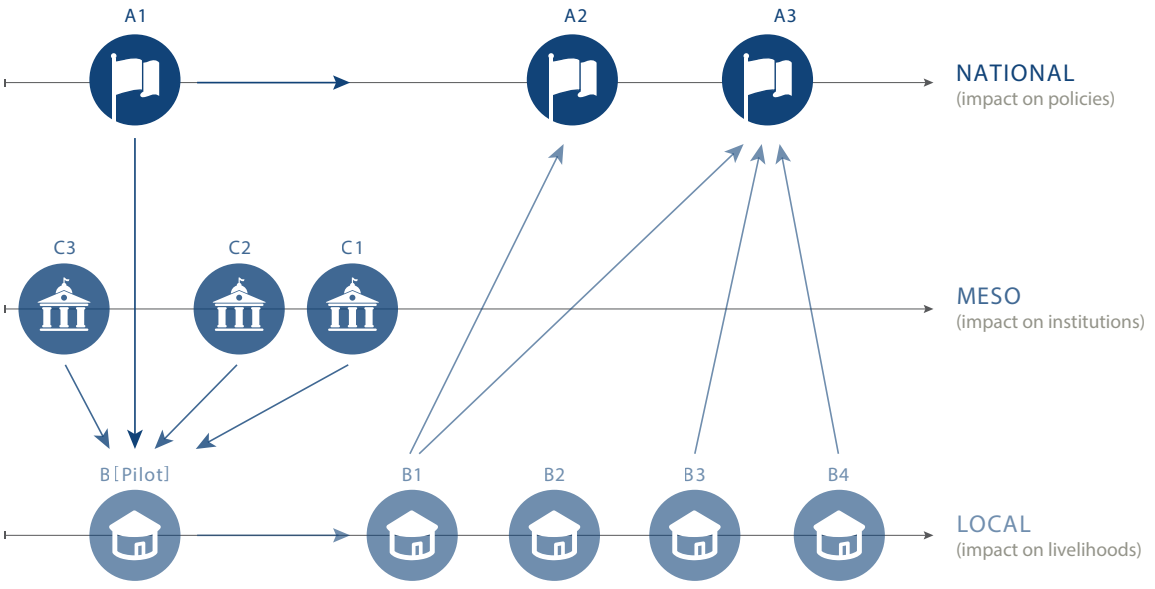
CATEGORY	DESCRIPTION
Impact of adaptation activities	■ The seed bank has improved access to small land holding farmers beyond the project coverage.[13] ■ mKRISHI is integrated into the National Initiative on Climate Resilient Agriculture (NICRA) . Tata DOCOMO, a cell service company, has expanded the mobile-based information service by introducing weather-based advisories through special mobile phone packages for farmers.[14] ■ Shared-cost benefit model for providing inventory of mechanization tools operationalized through "Custom Hiring Centres" in the NICRA smart village clusters in hundred villages (Srinivasrao et al. 2013).

About 5,000 enquiries were registered and about 80 percent of the enquiries were being answered by experts on a daily basis within the first two years (CESCRA 2013). Local, district, and national organizations identified the mobile-based weather information service as a candidate for horizontal scaling under the NICRA project[17].

Scaling Pathway

The NAIP sub-project is implemented by a consortium of mandated national- and state-level agricultural research organizations, and thereby follows a centralized scaling pathway. Figure 4 summarizes the scaling pathway as described by a scientist from the NAIP project. The consortium (A1 & C) implements pilots (B) as participatory action research projects with farmer communities mainly comprising marginal farmers. The lessons learned from crop varietal replacement, crop diversification, and mobile-based climate information services (mKRISHI) has informed national level policy-making bodies (A2&A3) like the Indian Council for Agricultural Research (ICAR) and Ministry of Environment and Forestry. Additionally, non-beneficiary farmers have adopted the set of activities at varying degrees as per their capacities(B1, B2, B3, B4).The lessons shared with ICAR (A2) enabled IARI to include the processes utilized in the NAIP sub-project in the national-level initiative of NICRA. The NICRA initiative covers 125 districts across the country and accommodates lessons from action research projects reported to ICAR, including the NAIP sub-project.

Figure 7. | **Scaling pathway led by IARI**



Conditions for Scaling

The impetus for scaling is built into the projects undertaken by IARI. By designing the NAIP sub-project activities based on existing adaptation technologies, the pilots focus on scaling the lessons from the outcomes of existing activities. The experience of the NAIP project highlights the value of building local institutions and suggests fostering partnerships at different levels as an effective means to promote scaling. The NAIP sub-project exhibits the following conditions for scaling.

Collaborating with local institutions can bridge the gap in institutional capacity to implement projects: Given the wide geographic spread, IARI was unable to work directly with every community[17]. To overcome this limitation, collaboration at the local level is used as a strategy, making it a proxy for the organizational capacity for effective implementation of the project. Apart from collaborating with local NGOs, IARI scientists have found newer avenues to implement project activities through co-operating interventions with the panchayat. The NICRA project emulates the learning from the process of setting up collaborations at the panchayat level[17].

Capacity to manage funds by local institutions improves availability of resources: In the NAIP sub-project, the cost of dissemination of technologies varied. At the farm level, the cost of technologies are low when compared to the investment toward providing common resources such as water harvesting structures and agricultural machinery (CESCRA 2013). This project set up a Village Resource Centre in the village blocks to manage and maintain the inventory of common resources. The village panchayat managed the funds with the support of partner NGOs to facilitate the auctioning process for disbursing funds to improve the common resources, the responsibility and decision-making left to the panchayat increased the capacities to handle funds to maintain the inventory of common resources at the village block level.

Multi-stakeholder engagement offers diverse expertise for effective implementation and dissemination of lessons: IARI recognizes the need for multiple stakeholders to implement the projects. Partnering with research organizations and NGOs familiar with the local conditions is considered critical for testing and demonstrating adaptation technologies. For instance, IARI collaborated with regional resource centers known as Krishi Vigyan Kendras and local NGOs to engage with farmer communities and ensure effective transfer of technologies. The Krishi Vigyan Kendras, dedicated to helping farmers, is situated in virtually every Indian district. They are an active network partner in the NAIP sub-project, which has helped improve their utility.

IARI partnered with the private company Tata Consultancy Limited to pilot mobile-based weather information services. The partnership focused on distributing special devices that enabled two-way communication between a data center and farmers. As the number of users of mobile services in rural areas increased, Tata DOCOMO expanded the services to farmers across different geographies. IARI seeks new partnerships as it realizes the amplifying effect of multi-actor partnerships. Scaling of learnings from the NAIP projects into new project proposals is an ongoing process[17]. NICRA is a large-scale initiative informed by the learning from the NAIP sub-project. The large area covered by the project necessitates collaboration of many lead scientists (mostly from IARI), partnering research institutions, panchayats, NGOs, and community-based organizations. New partnerships are a must according to IARI researchers. There are ongoing discussions to identify partners[17] at different levels.

Building organizational structures at the community level enhances horizontal scaling: In addition to managing physical inventory, the Village Resource Centre set up by the NAIP sub-project acted as a forum for farmers to share experiences of using adaptation technologies is said to enhance the process of horizontal scaling in the region. Providing an enabling environment for the diffusion of technologies is a critical element for scaling. For example, setting up Village Resource Centres and community seed banks have helped in effective dissemination of adaptation technologies to marginal farmers. However, according to the project implementer, scaling relevant organizational structures requires significant investments and institutional support. The lessons learned from the NAIP sub-project and other project experience at IARI informs

the Twelfth Five Year Plan of India, which encourages establishing and strengthening block and community level organizations.

Testing technologies in a participatory model and then establishing organizational structures to transfer technologies create an enabling environment: The cost effectiveness of the technologies for diffusion is an important factor in scaling. The experience from the implementation of the NAIP sub-project suggests farmers are responsive to technologies that have low input costs and provide yields with higher returns (CESCRA 2013). For instance, the consortium encourages the use of pheromone insect traps in project villages; farmers were willing to use the traps when they understood their cost effectiveness. In another instance, where seeds distributed among 500–600 self-selected farmers led to improved yields, there was wider uptake of the seed-related activity. Seeds distributed by IARI have now spread across villages, replacing the farmer seeds, although it is not clear whether this is a result of farmer activity or seed self-pollination. The visible impetus is the low cost for purchasing seed varieties resistant to climate variations. The seed bank ensures availability of the seeds at lower cost even after the project duration[17].

Understanding indigenous farming activities helps to build strategies to strengthen them: In the Ganjam district of Odisha state, prevailing farming activities by the households were compared to understand income patterns. A preliminary assessment revealed that households engaged in agriculture and livestock rearing activities earned higher income than the households that combined agriculture and fisheries as their major livelihood activity. The households that depended solely on agriculture for their livelihoods had the least income[18]. The findings informed the strategy for increasing the effectiveness of an IFS approach to provide livelihood security at the household level. In addition to increasing production and income, IFS improved the nutrition status of the households and created employment opportunities for the local people. The project consortium developed a strategy of pond-based IFS in Ganjam district, which has increased the net profit to Rs.37594 for every 1.25 ha (CESCRA 2013). The IFS pilot shows signs of being beneficial to many farmers, but creating greater demand for IFS will require a clearer understanding of household needs and farming activities[17]. Moreover, IARI recognizes the limitation of scaling IFS in other geographical regions as the indigenous activities vary and depend significantly on the local context.

Governmental institutions can take action to inform agricultural decision making through technology: IARI's mandate is to address issues related to Indian agriculture through science. In the NAIP sub-project, the farmers can take informed decisions when an agro-advisory is provided to them. This experience has provided an impetus to carry forward weather information service into an Integrated Agro-Meteorological Advisory Service proposed in the Twelfth Five Year Plan (Planning Commission India 2013).

Potential for Scaling and Recommendations

The IARI project shows positive impact[19], with lessons learned being scaled through subsequent projects such as NICRA and the extension of mKRISHI to new geographies. According to the typology of readiness for scaling set out in Chapter 2, it is at a model stage of scaling. Expansion of activities in larger regions will ensure relatively low risks to scaling. According to the interview with the IARI respondent, the key recommendations from the IARI case are as follows:

- **Provide a methodology for the consultations** undertaken to identify the most appropriate adaptation activities in a given site, in the context of a project that intends to scale in the future. This will enable less experienced organizations to incorporate the context-specific nature of adaptation into their future work, and to focus on scaling from the beginning.

- **Document lessons learned from partnerships**, such as those with the local panchayat and with private sector players, to understand and to be able to share what works and what pitfalls to avoid.

- **Build on the strengths and capacities of the consortium partners**, who may be able to contribute to the scaling endeavor in different ways.

4.3 Watershed Organisation Trust (WOTR)

Table 3. | **Summary of WOTR Case Study**

CATEGORY	DESCRIPTION
Name of the project	Climate Change Adaptation project
Project years	2009 & ongoing
Funded by	2009–2014: NABARD and Swiss Agency for Development and Cooperation; Ongoing activities through the co-finance model with various funding partners
Collaborators	■ NABARD ■ Swiss Agency for Development and Cooperation ■ WOTR ■ India Meteorological Department ■ Ministry of Earth Sciences ■ The Bharati Vidyapeet Institute for Environment Education and Research ■ Central Research Institute for Dryland Agriculture (CRIDA) ■ Mahatma Phule Krishi Vidyapeeth (State Agricultural University)
Regional coverage	In districts across Maharashtra, Madhya Pradesh, and Andhra Pradesh ■ Forty-nine villages funded by NABARD and the Swiss Agency for Development and Cooperation ■ Scaled to twenty-three villages and expanding through the co-financing model
Climatic stress	Drought prone, low-water availability, weather variability, and associated changes in the ecosystem Impacts on biodiversity: Change in species distribution, increased extinction rate, and changes in length of growing seasons for plants
Non-climatic stress	Extraction of groundwater, market driven agriculture, scarcity of non-farm livelihood opportunities, limited access to energy for domestic use, nutrition and health challenges, and gender inequality
Activities	■ Crop Management □ System for Crop Intensification ■ Farm Management □ Contingency crop planner □ Farmer Field School □ Restoring linkages of livestock in rainfed farming system □ Organic composting and pest management ■ Agro-Weather Advisory □ AgriMet local weather advisory for village clusters □ Locale-specific crop weather advisories for 12 crops ■ Water Conservation □ Water budgeting ■ Non-Farming □ Community Driven Vulnerability Evaluation suite of tools □ People's Biodiversity Registers □ Skill training for women and youth to strengthen livelihood □ Alternate energy for household use

CATEGORY	DESCRIPTION
Activities for scaling	■ CoDriVe suite of tools has been used in geographical regions beyond Maharashtra covered under the project. ■ Experience from AgriMet local weather advisory is included in an ongoing scaling study by the India Meteorological Department. ■ Farmer field schools, water budgeting, and livestock management are extended to other villages through the co-financing model.
Impact of activities	■ Experiences of integrated approach are shared with NABARD to inform the Climate Change Adaptation funding component within Adaptation fund, which is in the process..

Background

The Watershed Organisation Trust (WOTR) implements the 'Climate Change Adaptation (CCA) project and leads efforts to scale this project with funding from the Swiss Agency for Development and Cooperation and National Bank for Agriculture and Rural Development (NABARD). The project aims to reduce farmers' vulnerabilities to increasingly varying weather conditions and build adaptive capacity to climate change. A cluster of villages within which few villages had earlier completed watershed development was identified to implement the CCA project. According to the project implementer, CCA project combine soil and water conservation activities with activities identified through an assessment of local climate change vulnerabilities[20]. Community-driven assessments strongly influence the project's design.

Climate change creates vulnerabilities that are dynamic over time and across geographies. The CCA project employs an ecosystems approach, which builds a wide variety of capacities in rural communities to help sustain their livelihoods (WOTR 2013c). To fully capture community perspectives on both climate- and on non-climate-related vulnerabilities, WOTR developed CoDriVE–PD: a climate-risk assessment tool that helps to assess both livelihoods resource vulnerability (land, water, tree cover, and watershed) and community vulnerabilities[20] (community group and gender disaggregated) in a village[21]. The application of the tool provides a five-digit code based on the status of the five capitals (human, natural, financial, social, and physical) for the respective groups within the village and for the village as a whole; the results provide guidance for a climate adaptive project design (WOTR 2013c). WOTR further developed CoDriVE–LA[22], which tracks money flows within and outside a given village and assesses livelihood vulnerabilities to climate change and other externalities (e.g. market forces).

The CoDriVE–PD assessment identified the following seven cross-cutting, multi-sectoral strategies (WOTR 2013c). Collectively, these strategies form the "Climate Smart Adaptation Interventions" (WOTR 2013c). Some of these strategies look into the impact of climate change while factoring in non-climate stress factors.

- Adaptive sustainable agriculture
- Locale-specific weather-based agro-advisory
- Biodiversity conservation
- Water resource management and enhanced water efficiency
- Livestock development
- Disaster risk reduction
- Livelihood strengthening

According to the interviewee, the CCA project seeks to reach village communities with strategies that account for extreme weather variations and uncertainties such as market fluctuations. The CCA project model promotes income-diversification opportunities and diversified cropping and farming systems that can buffer farmers from income and food loss associated with market fluctuations. Through co-financing, the project promotes non-farm activities—such as food processing, marketing, value addition, and non-farm skills—to enhance livelihoods (WOTR 2013b).

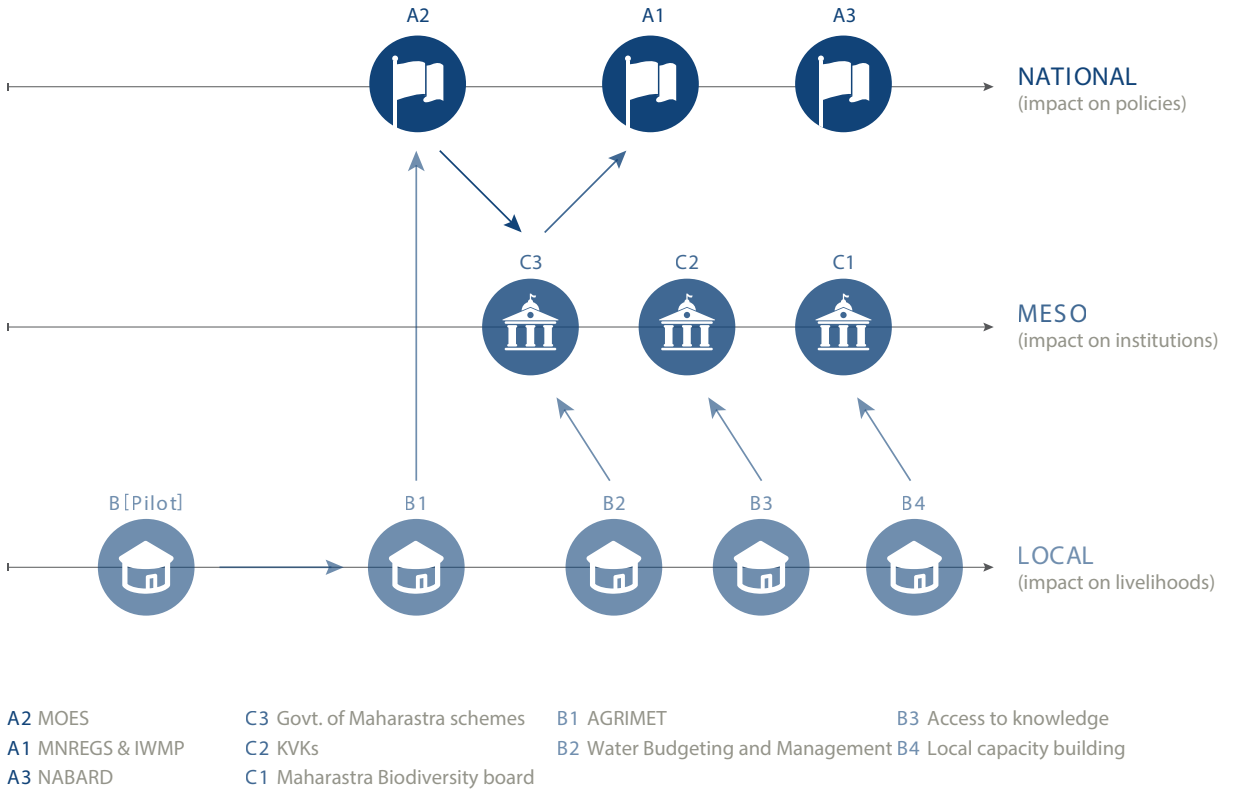
Scaling Pathway

The CCA project is a systems-based project that integrates various interlinked components based on vulnerability assessments. Its scaling pathway can be described as NGO-driven (described in Chapter 2), and partnerships play a significant role in its scaling trajectory. As shown in Figure 5, the key implementer, WOTR, demonstrated locale-specific activities (B), which reduced weather-related risks to farmers. Activities included the following:

- Providing locale-specific weather-based agro-advisories (B1)
- Preparing block-specific crop weather calendars and contingency crop plans in partnership with CRIDA and the state agriculture university
- Reducing input costs and increasing productivity and food security
- Training village youth for water budgeting, volunteers for water management methods for judicious use of water (B2)
- Setting up on-site support through farmer field schools that brought expertise from the other experts that include regional State Agricultural University to the village (B3)
- Training youth and women in biodiversity conservation, disaster risk reduction, and low external input agricultural methods that improved the adaptive capacity of the village (B4)

The project informs meso-level agencies by engaging with them through capacity building programs and partnering with mandated institutions for planned activities (C1, C2, and C3). Integrating the approach with national schemes and institutions (A1 and A2) has also been achieved to an extent, and this has created a possibility for vertical scaling. The project collaborates with NABARD (A3) to make funding available by demonstrating the results of the activities. Strategic partnerships for locale-specific activities[23], particularly with mandated institutions, emerge as an effective means of scaling.

Figure 8 | **Scaling pathway led by WOTR**



Conditions for Scaling

WOTR acknowledges that not all project activities are scalable; activities that involve experimentation may not be ready to scale. WOTR also recognizes the value of participatory technology demonstration in promoting appropriate adaptation activities. According to the interviewee, the positive outcome and uptake of specific adaptation measures should inform policies at the state and national levels. Additionally, community experience and ownership plays a critical role in creating a responsive environment for adaptation to succeed at the village level.

Sharing lessons learned can enable scaling: Funding is critical for an NGO like WOTR to be able to test adaptation strategies and technologies. In the interview, the project implementer reported that the CCA project aimed to inform funding institutions like NABARD, which is mandated to establish and manage adaptation funds. A similar strategy adopted under the Indo-German Watershed Development Programme, spearheaded by WOTR and NABARD, led to the creation of the National Watershed Development Fund.

According to the respondent, WOTR provides attention to consolidate lessons from CCA project experiences and packages them as capacity building courses for officials in the line departments, other NGOs, and research organizations. For instance, WOTR has shared lessons from the CCA project with individuals from 140 institutions by facilitating state, national and international training programs[24]. WOTR's aim is to increase the capacities of these organizations to effectively generate and use resources to support vulnerable communities.

Building capacities of village youth to enhance decision making: There is untapped potential in the village youth, who can be trained and constructively engaged in weather advisory and other service provision at the local level. According to the respondent, the youth have enormous potential to make timely and appropriate farming decisions. As part of the CCA project, the youth are trained in disaster risk reduction, biodiversity and ecosystems management, and water budgeting. The various trainings reflect an integrated approach to improving sustainable agriculture at the block and village levels. In addition to working with the youth, WOTR is involved in training women not only to strengthen their role in agriculture, food security, and nutrition but also to manage resources effectively at the local level.

Collaborations are critical to scaling: Though WOTR provides leadership in directly implementing the CCA project, it recognizes the value of partnerships that bring in diverse expertise at different stages of the project. This strategy is acknowledged as an important component of success by WOTR (WOTR 2013b). In the CCA project, WOTR collaborated with a variety of partners, namely NABARD as a major Indian funding partner and the India Meteorological Department, Ministry of Earth Sciences, Bharati Vidyapeet Institute for Environment Education and Research, CRIDA, and State Agricultural University as technical partners. Apart from expert collaboration, the project implementers were engaged with a network of NGOs to build capacities and share knowledge products, particularly with a motive to scale the approach taken in the CCA project (WOTR 2013c).

Design and implementation of appropriate activities is driven by community partnership: According to the project implementer interviewed for this report, partnerships at the community level and among clusters of neighboring villages has been critical to the success of the CCA project. Sharing of expert knowledge is focused on the issues raised by the farmers. The issues that rural communities face continue to change[20] and the CoDriVE suite of tools is designed particularly to capture dynamic issues. For instance, CoDriVE–Visual Integrator has been well-received by farmers, as it helps the cluster of villages involved to understand the current status of the local environmental and socio-economic conditions for both positive and negative impacts of the activities related to their livelihoods. Relevant information generated through such assessments serve as the basis for the design and implementation of project activities.

Rate of scaling varies for activities: A significant lesson that emerges from the CCA project experience is that activities scale at different rates. Farmers may take up some technologies more promptly than others[20]. For instance, state authorities in Andhra Pradesh

and Telangana are implementing a pilot of the CoDRiVE-PD framework for vulnerability assessment by integrating it into the IWMP project[24]. On the other hand, AgriMet, the locale-specific weather advisory, was adopted by the farmers directly and swiftly in the regions (Lobo 2015).

POTENTIAL FOR SCALING AND RECOMMENDATIONS

Given the climate change and fluctuating markets, the CCA project implementers consider the simple replication of interventions unsuitable; scaling can only be accomplished through proper project plans, focusing on lessons learned by establishing appropriate processes and organizational structures[20]. According to the project implementer, farmers report the best results when activities are identified through an intensive assessment and technologies are demonstrated through community participation.

The CCA project implementer identified the following recommendations for scaling adaptation efforts:

An ecosystems-based approach integrated with current models of participatory watershed management is important for building adaptive capacity in rainfed regions. WOTR considers that villages that have engaged in previous watershed development activities, also known as watershed treated villages, as conducive for implementing CCA activities. For villages that have not undergone the process of participatory watershed development, WOTR emphasizes the need of having Climate Change in focus, hence to implement the CCA project as a whole which includes participatory watershed development.

Conducting vulnerability assessments at the village cluster or block levels, in partnership with the local community, is a critical action for building locale-specific adaptation strategies. The experience with tools like CoDriVE suggests the need for collective assessment of locale-specific vulnerabilities.

Local-specific efforts are relevant to the design and development of successful CCA programs. This can include weather advisories, contingent crop planning, low external input technology, water budgeting, livelihood diversification, and biodiversity conservation. Integrating these strategies into national- and state-level natural resource management initiatives can strengthen the scaling objectives of CCA programs.

Strategically envisioned and established public–private–civil society partnerships may be important. Depending on the project, these partnerships can create an important enabling environment to build adaptive capacities within farming communities

4.4 Unnati

Table 4. | **Summary of Unnati Case Study**

CATEGORY	DESCRIPTION
Name of the project	Strengthening Community Capacity on Disaster Risk Reduction in Rajasthan (SCCDRR)
Project years	2008–2011
Funded by	Catholic Organisation for Relief and Development Aid (Cordaid)
Consortium	■ Local NGOs: ■ Prayas Santhan ■ Vasundhara Seva Samiti ■ Jai Bhim Vikas Shikshan Sansthan ■ Urmul Marusthali Bunkar Vikas Samiti ■ IDEA Sansthan Technical capacity building partners: ■ Central Arid Zone Research Institute (CAZRI) ■ Department of Horticulture, Rajasthan
Regional coverage	Barmer (arid) and Jodhpur (semi-arid) districts of Rajasthan
Climatic stress	■ Extremely drought-prone region ■ Low atmospheric moisture ■ Increasing temperature ■ Wide gap in diurnal temperatures
Non-climatic stress	■ Low water-holding capacity of soil in certain areas ■ Plummeting common natural resources ■ Desertification due to sand dune movements ■ Caste-based politics ■ Social and gender inequality ■ Powerless local institutions in decision making process
Activities	■ Farm Management □ Agro-horticulture, pest management, integrated livestock and farm management ■ Soil Conservation □ Use of organic manure, plantation of trees along the farm boundary ■ Water Conservation □ Construction of farm tanks, earthen pot irrigation ■ Water Provision □ Transport of water from common resources to individual tank ■ Additional □ Awareness regarding insurance schemes, education, health, and gender sensitivity
Activities for scaling	Project still in pilot stage
Impact of adaptation activities	■ Increased earnings ■ Asset building (livestock and irrigation facilities) ■ Reduced out-migration ■ Soil and water conservation along with regeneration of pasture land ■ Reduction in gender inequality gap ■ Increased educational facilities for dalit kids

Background

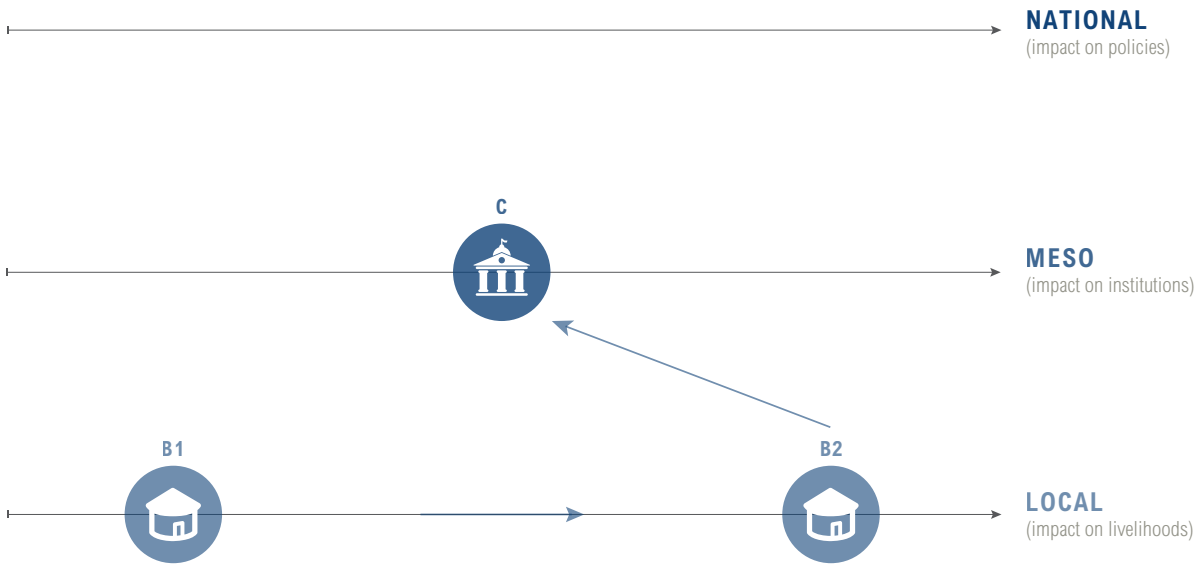
"Strengthening Community Capacity on Disaster Risk Reduction in Rajasthan" (SCCDRR) was a three-year (2008–2011) project initiated by Unnati and supported by Cordaid, the Catholic Organisation for Relief and Development Aid. The project, targeting dalits[1], grew from the Oxfam-supported "Building Community Resilience on Drought" (BCRD) project, which aimed to help economically and socially vulnerable groups in the Thar Desert area meet their basic needs (Unnati, 2009). The project period was marked by a drought cycle, which led to water and food scarcity. Thus, the project evolved to look at holistic development, which focused on drinking water security, agro-forestry, and pastureland development. BCRD then transitioned into SCCDRR, which used the Community Managed Disaster Risk Reduction approach and was extended to other areas.

Vulnerability assessments in the Jodhpur and Barmer districts of Rajasthan informed the design of project activities. According to the project implementer, the activities initiated were aimed at reducing the vulnerability of the dalit communities to drought and increasing their ability to adapt to climate variability. The assessments focused on past and future climate trends, prevailing coping mechanisms, livelihoods, and the regional environment.

Unnati led the scaling effort and sought to promote food, water, and livelihood security among dalits by providing livelihood options and continuous access to water. The design of the adaptation activities included the following (Unnati 2011):

- Constructing tanks to harvest rainwater for drinking and agriculture.
- Developing horticultural and fodder plots with local species of trees, fruit, pulses and sesames. These plots have also led to regeneration of local grass species (Sewan) that is used as fodder.
- Forming sixty-five task forces and Village Development Committees under Dalit Resource Centers that provided training on adaptation activities and monitored drought relief services.
- Linking 1,074 families (5,400 members) to home/farm, accident, and life insurance schemes introduced by the state or central government.
- Providing physical assets, such as a tanker to transport water from common sources to tanks.

Figure 9 | **Scaling pathway led by Unnati**



After four years of project completion, the horticultural and fodder plots established under the project have been observed to provide an annual income of Rs.15,000–20,000 ($250–330) through a steady supply of fodder for nearly fifteen goats per household despite the harsh drought conditions.(Unnati 2011) According to the project implementer, the project has provided the local communities with much-needed additional income, reduced out-migration, improved health access, and improved access to common property[25].

Creation of assets like fodder plots, livestock, and housing have helped local communities to manage climate risks effectively. According to the project implementer, beneficiaries realize returns on their investment in three-year periods, and project activities are designed to have low recurring costs. Although the project's target population was dalit communities, it can potentially benefit other vulnerable and marginalized groups. Several communities have expressed interest in or adopted some of the project's horticulture activities. However, replication risk is said to be high, as the evidence is drawn from only two districts of Rajasthan. Therefore, this project is still at the pilot stage.

Scaling Pathway

Financial constraints prevented Unnati from transitioning from a pilot to a large-scale project. Figure 6 illustrates the first set of pilots under the Oxfam BCRD project (B). These pilot activities focused on livelihoods and expanded through the SCCDRR project (B1). The institutional changes that took place through MGNREGS are shown as C, occurring at the meso level. Spontaneous scaling does not appear in the figure but non-beneficiaries also adopted some of the interventions, which require low or no investment. Demonstration projects are traditionally undertaken in the plots of the rich and powerful villagers, but based on the project implementer's experience if demonstration projects are successful in a poor person's plot, then others will spontaneously adopt adaptation activities. Spontaneous scaling not only costs less than formally planned projects, but also helps successfully mobilize local communities.

Conditions for Scaling

Though several conditions identified in the adaptation scaling framework, such as financial resources, local factors, and partnerships, have found to affect the scaling potential of the Unnati project, the community ownership model promoted through co-financing as a vehicle has been found to provide the key impetus for scaling in the Unnati project context. The conditions that affected Unnati's scaling experience are discussed next.

Using the co-finance model to foster community ownership: Cordaid supported the project in the initial phase because beneficiaries were too poor to provide co-financing. However, beneficiaries of the agro-horticulture demonstration projects provided close to 25 percent of the project cost through labor support, by sharing the cost of construction of tanks, and by providing saplings. Engagement of the local community and investment sharing arrangements encouraged community ownership. (Unnati 2011) Despite all the positive attributes, the community-owned model has not generated sufficient financial resources to expand to additional households and villages beyond the twenty-three villages under the SCCDRR program. Unnati is optimistic that it will secure funding and continue to promote the community-owned co-finance model, which will provide the opportunity to scale horizontally.

Local context: As Unnati had designed the adaptation activities for dalit communities, they closely studied the challenges faced by dalits and the means by which they could bring awareness about the issue in the study villages. Unnati identified capacity building and instituting progressive farmer training programs at the local level as key factors in expanding the project benefits. The study also highlighted some of the inhibiting factors that affected scaling. For example, caste politics, poor literacy levels among the lower caste population, poor reach of the policies and programs, and weak integration of NGOs in government are some of the factors that were identified as barriers to scaling at the local level.

Involving multiple partners with specialized skills for desirable results: Unnati partnered with CAZRI and the Rajasthan State Department of Horticulture to provide technical expertise and training to beneficiaries on horticulture activities. Unnati also collaborated with local NGOs in activities including vulnerability assessment, project planning, community mobilization, and training programs. Local NGOs were also involved in managing assets, and monitoring and evaluating the project. According to the project implementer, partnerships and collaborations helped not only to fill the capacity gaps but also to enhance the reach of the project.

Securing support from the government: To attract additional resources, Unnati presented the state government with evidence of successful drought risk reduction activities. In response, the government integrated support for tank construction into MGNREGS. The inclusion of tank construction activity within the MGNREGS program has helped the wider implementation of the tank construction activity. With support from Unnati, more than 500 families have submitted applications to access the scheme[26].

Local institutes matter: According to Unnati, scaling requires a healthy partnership with community-based organizations and local institutions like Village Development Committees and Dalit Resource Centers. Nurturing local institutes, encouraging knowledge sharing among farmers, and building local ownership helped the foundation to further the project objectives.

Knowledge sharing via established networks results in greater dissemination of ideas: Unnati presented the project and its learning within various networks, including the National Alliance for Disaster Risk Reduction, the Asian Disaster Risk Reduction Network, the Cordaid India Disaster Risk Reduction Partners Network, and the National Campaign for Dalit Human Rights. To promote vertical scaling, Unnati also published knowledge products such as manuals, project reports, posters, and audio-visuals aimed at state and national decision makers.

Monitoring is powerful: The project implementer reported that continuous monitoring, with support from partner NGOs, helped Unnati understand the impact of activities on beneficiaries' land. This evolving understanding allowed project implementers to suggest modified water and soil management techniques over the course of the project. By

monitoring, they were also able to understand how the adaptation activities withstood drought, which enabled them to plan for future uncertainties and inform the beneficiaries.

Potential for Scaling and Recommendations

Unnati plans to scale the project: it is sharing lessons learned from the pilots with funding agencies and the state governments of Rajasthan and Gujarat to attract funding to scale horizontally and vertically. Based on Unnati's experience, the project implementer offered the following recommendations for scaling:

Community ownership is key to scaling efforts. The co-finance model promoted by Unnati created considerable buy-in for the local stakeholders in the project and this needs to be consciously promoted to expand the reach of the project benefits.

Roles and responsibilities should be clearly defined. In Unnati's experience, local governments (panchayats)[2] are not clear on their roles and responsibilities in conserving key resources such as water. Clearly defined roles are key to managing common property resources more effectively. Additionally, governments need to be involved in a renegotiation of physical land boundaries to preserve and develop common property resources.

Strengthening access to common property resources could provide alternate livelihood options to marginalized communities. Common property resources could help communities to adapt to climate variability with less regular assistance from government.

Early warning systems and agro-advisories need to be deployed on a small scale. Ideally, this information would be shared at village and block levels to inform farmers about their crop options, and prospects to reduce crop loss is key to building climate resilience.

Integrating disaster risk reduction and livelihood programs with national and state schemes could help scale adaptation. Integrating disaster risk reduction and adaptation into schemes like MGNREGS and the Orchard Development Scheme under the National Horticulture Mission can help create much-needed physical assets. This would help reduce the costs incurred by implementing agencies, allowing more beneficiaries to be included under a project.

Planning for scale can enable success. If early project design includes the plans to scale, the process to mobilize and manage resources for scaling becomes much easier than if they are not explicitly planned for in the project design.

Key insights from Case Studies on Good Adaptation Practice Indicators and Conditions for Scaling

This section highlights the key insights gathered from the four detailed case studies in terms of both the assessments of good adaptation practice indicators and the conditions for scaling as explained in the scaling adaptation framework in Chapter 2.

Incorporating findings from vulnerability assessments

The conditions faced by the farming communities in each of the four case studies illustrate the importance of conducting vulnerability assessments to ensure appropriate adaptation responses. However, the information shared by the respondents in the case study interviews points to several challenges in conducting suitable vulnerability assessments. For instance, IARI reported that the organizations it works with are sometimes limited in their capacity to conduct assessments at the grassroots level. In these cases, IARI collaborates with local organizations to bring the necessary assessment capacities to the project team. Assessments can be used to select locations: for instance, WASSAN and WOTR have used the assessments,

including climate-related vulnerability assessments, as a preparatory exercise at the early stage of projects in selected locales. The vulnerability assessments have also helped implementers design relevant activities. In some cases, a narrower assessment may be required, as in the case of Unnati where the project focuses on a specific section of the society: the dalit communities. However, Unnati's narrow focus on a particular target group may restrict its scaling potential.

Incorporating analysis of past and future climate trends

Vulnerability assessments coupled with climate trend analysis have provided the basis for adaptation planning. Each of the four case studies highlights the value of climate trends analysis, both past and future. Climate analysis has helped not only in identifying the risks, but also in building relevant plans of action to manage those risks effectively. For example, in the case of IARI, climate analysis along with analysis of optimal parameters like soil profile, water availability, and vegetative cover has enabled the appropriate choice of seed varieties for a given location from the repository of expertise in crop improvement technology, developed over years.

Providing climate information services

The interview respondents agreed that the right information at the right time is critical to managing climate risks in climate-sensitive sectors like agriculture. IARI and WOTR's use of mobile-based agro-weather advisory services

has helped in providing short- and medium-term weather information and timely crop advisories. Locale-specific agro-advisories have proved useful in saving input-related resources and deploying appropriate agronomic activities. WOTR has experimented with the cluster-level weather-based advisories that expand to a regional scale using information communication technology (ICT) and expert support.

Valuing partnerships and collaborations

Although their approaches vary, both the IARI and WASSAN projects showcase how important partnerships are for effective scaling.. IARI is a national institution with a nationwide research mandate. Its presence across the country and ability to work with multiple partners seem to present an advantage in facilitating a certain degree of scaling. In contrast, WASSAN and Unnati are able to create scaling opportunities predominantly by integrating activities either with state or national level agencies. Unnati emphasizes knowledge sharing through trainings, workshops, reports, site visits, and regular meetings, which are used as a means for vertical scaling. Horizontal scaling opportunities increase when NGOs are willing to leverage the peer networks and share knowledge by providing appropriate training and capacities to fellow NGOs working in the region.

Addressing resource needs

"Resource centers" have been found productive in promoting and furthering adaptation efforts. The case studies highlight the importance of establishing such facilities at the village cluster level. In the case of Unnati, several "task forces" and "village committees" were set up to provide training on issues such as vulnerability assessment, project planning, running membership campaigns, and tracking state and national schemes for the dalit community. Through a network of Wasundhara Sevikas/ Sevaks comprising mostly village women and youth, WOTR trained a cadre of workers to operate and maintain automatic weather stations, and conduct ecosystem services awareness, vulnerability assessment, and other activities. WOTR considers this an important means to build capacities and generate employment at the local level, which can enhance the opportunities for scaling. IARI's experience suggests that these resource centers can promote the mechanization of agriculture by managing tools and machinery as a common inventory available to marginal farmers in the village clusters, which helps in wider reach of intended outcomes.

Adaptation costs also play a significant role in the scaling process. Adaptation costs largely hinge upon two critical factors: the kind of adaptation technology that is used, and the status of social capital in a given context. The interviews conducted for the case studies suggest that farmers are receptive to technologies or activities that have low input costs, and to technologies that banks and credit schemes are willing to fund. In several of the projects studied, subsidies play a critical role in promoting scaling. These include subsidies for farmers and concessions to NGOs. When subsidies and concessions are embedded in government programs, they can play an important role in enabling scaling. Adaptation projects should plan to use these mechanisms to scale, in terms of both the number of beneficiaries reached and the geography covered. For instance, in the case of IARI-supported projects, the smallholder farmers covered input costs for seed trials and pheromone traps while project and government funds were used to invest in equipment.

The interviews with project managers indicate that the costs associated with building social capital, particularly in terms of strengthening the prevailing local institutional structures, were largely beneficial in the long run. Such investments paid off in the projects run by WASSAN and WOTR, where a conscious effort was made to invest on community institution building in order to sustain the local capacities developed over longer periods. For this purpose, they have resorted to co-financing models with the help of Corporate Social Responsibility initiatives promoted by private sectors.

Fostering community ownership

The case study analysis also shows that community ownership is critical to scaling. Although the literature on adaptation and rural development typically emphasizes participatory approaches, there has been little investment into systematically understanding and documenting the associated processes. WASSAN and IARI have emphasized the need to build strong leadership and grassroots organizations to better manage natural resources under climate variance. They specifically promote the involvement of the state government and village-level organizations to create ownership.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

When determining if an adaptation intervention is ready for scaling, implementers face the challenge of identifying the right indicators of good adaptation practice to ensure effective adaptation activities are scaled.

This is challenging for several reasons: (i) adaptation activities in different contexts look very different from each other, which makes it difficult to determine what is "good"; (ii) climate change is inherently a long-term phenomenon, and adaptation efforts are rarely monitored or evaluated for success beyond five years; (iii) despite improved climate projections, climate impacts are still uncertain, which makes it impossible to know whether adaptation efforts will be successful in the future; and (iv) it is difficult to know when a reduction in vulnerability or an increase in adaptability is due to an adaptation project or another driver. Another challenge that those trying to scale adaptation activities face is limited understanding of possible approaches to scaling and criteria for choosing the appropriate one. These challenges make the concept of "good adaptation" one that is still evolving and more research on what adaptation activities work will help clarify what is "good" and fit for scaling.

To date, there is limited understanding of what indicates good adaptation practice, how to identify and undertake suitable good adaptation interventions, and, subsequently, how to scale such interventions. Therefore, the scaling framework in this report helps not only to identify good adaptation practices, but also to understand and analyse the process of scaling. There are several conclusions that can be drawn about the scaling adaptation framework. They include the following:

- Working with multiple actors is a challenge due to differing agendas and complex relationships. Additionally, working across geographies with multiple actors and scales poses more challenges with regards to identifying which partner to work with and how, in order to scale successfully. Although there can be tensions between partners while deciding on how to scale adaptation activities, partnerships also provide an avenue for working together to successfully scale adaptation activities.

- There is no blueprint for scaling adaptation practices. Considering the numerous pathways and conditions that determine scaling, there is no one "right" way to scale adaptation activities. When designing scaling strategies, the various pathways, actors, and conditions that could impact scaling efforts need to be identified and addressed to minimize future challenges of scaling adaptation activities.

Recommendations for identifying and enabling good adaptation

The case studies suggest that several factors influence an adaptation project's ability to deliver desired results. These include good management plans; alignment with relevant national and state policies; and an emphasis on technical fit, cost effectiveness, flexibility, appropriate skill sets, building resilience to uncertainty, and attention to equity issues. In addition, implementers, policy makers, and funders can play specific roles.

Implementers should

- systematically identify and document existing adaptation success and farmer innovations, and assess whether they qualify as "good" adaptation;
- build vulnerability assessment and climate trend analyses into the early stages of project design and implementation;
- address the need for climate information services—such as agro-advisories, seasonal forecasting, and early warning systems—as elements of adaptation in monsoon-dependent, rainfed agricultural contexts; and
- address the uncertainty inherent in climate change by building the capacity of project teams and beneficiaries to understand the drivers of climate risk, so that they can make appropriate choices.

Policy makers should

- integrate successful adaptation initiatives into government schemes and policies that address the agriculture and water sectors. The authors observed that when there was a buy-in from the government the projects had enhanced reach and fewer risks for scaling; and
- focus on developing and strengthening practical and cost-effective resource management schemes besides promoting knowledge management.

Funding Agencies should

- pay special attention to promoting good adaptation practices. This would entail a thorough understanding of the indicators of good adaptation practice;
- focus on (i) training programs that would help project staff to identify and cultivate indicators of good adaptation practice; (ii) M&E systems to track good adaptation interventions; and
- devote resources to the collection and communication of best practices across agencies and communities. Knowledge and information sharing is central.

Conclusions and recommendations for scaling adaptation

In the scaling context, processes, pathways, and conditions count. The assessments and findings led to the following recommendations.

Implementers should

- identify activities that are already showing potential for scaling;
- systematically assess both the enabling factors and the barriers that inhibit the scaling of effective activities and device strategies to identify appropriate scaling pathways. The scaling adaptation framework can be used for this effort;
- expand communications and outreach about successful adaptation to prompt widespread acceptance and scaling of successful activities;
- promote monitoring, assessment, and feedback that can enhance scaling; and
- foster partnerships and networks to address capacity gaps that limit scaling.

Policy makers should

- define targets, geographic areas, skills, and required financial resources for scaling adaptation, so that scaling efforts can be targeted;
- establish mechanisms that enable scaling, especially through policy. For example, the emerging state action plans for climate change under the National Action Plan on Climate Change should consider devising an innovative incentive mechanism to promote scaling;
- align support for specific potential interventions with state and national policies and schemes; and
- promote collaboration among researchers, practitioners, policy makers, funding agencies, and NGOs.

Funding agencies should

- initiate adaptation activities that have a clear, replicable, cost-effective and demonstrable technology with provision for a self-sustained funding mechanism;
- create a checklist for scaling, taking into consideration elements such as appropriateness of adaptation technology, geography, organizational endowments, household endowments, networks, sound results-based M&E framework and knowledge-sharing platforms; and
- to the extent possible, create a mandate to fund projects that focus on scaling efforts in the adaptation domain.

Way Forward

Additional data, information, and insights are needed to update and expand the understanding of adaptation activities and their scalability. For this to happen, it is imperative that practitioners identify, monitor, and track adaptation activities and build on lessons learned. This report is not an end in itself; instead, it is a first step toward developing a unique scaling adaptation framework to enable project implementers, policymakers, and funding agencies to better understand the process of scaling adaptation projects. Findings from the study also provide critical insights into promoting adaptation activities and conditions for scaling in the rainfed agriculture context.

ANNEX A: DETAILED DESCRIPTION OF THE ADAPTATION SCALING FRAMEWORK

1. What are the indicators of good adaptation practice?

This report proposes a set of good practice indicators based upon a literature review that examined lessons from experiences to date with adaptation activities. As lessons thus far have necessarily focused more on the process of adaptation than on its ultimate outcomes, the six indicators presented here do not guarantee that a "good practice" activity will result in a successful outcome. Furthermore, not every indicator will be relevant to every adaptation practice. Nevertheless, these indicators together provide a starting point for identifying good adaptation practices. The indicators are as follows:

- **Incorporates findings from vulnerability assessments**. Vulnerability assessments gauge exposure and sensitivity to social, economic, and natural vulnerabilities within a system and a given context. The results of the assessment then informs the design of adaptation projects that reduce vulnerability over time and build adaptive capacity among marginalized people who depend on natural resources (Adger et al. 2005; Noble et al. 2014; Sterrett 2011). Conducting a vulnerability assessment may also help provide a baseline by which to measure, over time, whether a project has reduced vulnerability. Ex-ante vulnerability studies in particular provide a starting point for designing actions to limit the negative impacts of climate change and designing assessments for ongoing innovations and responses to climate change (Kelly and Adger 2000; Preston 2012). An ex-post vulnerability study once a project is completed can also help assess if vulnerability has reduced. In Rajasthan, for example, Oxfam and Unnati (a non-governmental organization (NGO)) assessed climate hazards, social organization at the village level, and the presence of local partners and service providers. They used the assessment to design and implement a program to reduce drought impacts (see case study in section 4.4).

- **Incorporates analysis of past and future climate trends**. Climate change is inherently a long-term challenge. In order to plan long term, adaptation planners integrate data and information on climate trends into the design of adaptation projects. In order for adaptation projects to specifically address impacts of past, current, and future climate trends, vulnerability assessments should include climate data and information, as well as identify climate-related risks. Detailed literature review and experiential learning shared by practitioners suggest that the analysis of meteorological conditions in particular is critical in contributing to good adaptation planning (Hills et al. 2013). There are numerous examples from Africa and Latin America where vulnerability assessments integrated past and future climate trends to help plan adaptation projects (ARCC 2014).

- **Provides climate information services**. While not appropriate for every adaptation project, climate information services can help beneficiaries make informed decisions. This is especially true for the agricultural practices of people in rainfed areas of India. Weather advisories include forecasts based on climate information and incorporate sector-specific knowledge that helps reduce climate risks. Appropriate communication tools can disseminate advisories to help achieve intended adaptation outcomes (Tall et.al 2013). MKrishi, detailed in section 4.2, is an example of one such weather service in India.

- **Promotes knowledge sharing**. Building knowledge sharing into an adaptation project allows lessons learned from implementing the project to be shared with those who wish to scale adaptation activities. Iterative learning is also key to contending with the uncertainty inherent in the question of how climate change impacts will ultimately play out (Dinshaw et al. 2014). Knowledge-sharing feedback loops can help modify projects or activities quickly when new information becomes available and ensure that when a project scales it brings bigger benefits to people. Incentives, channels, and platforms that facilitate greater information and climate change data sharing among institutions and projects are important to facilitate learning among institutions and communities (CAREC-APAN 2012). The case study in section 4.1 shows that implementers of the Andhra Pradesh Drought Adaptation Initiative (APDAI) project integrated knowledge-sharing activities into the operational design of the project. Lessons and knowledge from the pilot stage have helped the initiative create an impact at the local and national levels.

- **Addresses uncertainty**. Despite improved climate projections, climate impacts are still uncertain, making it difficult to know whether adaptation efforts will be successful in the future. To respond to the high degree of uncertainty associated with climate impacts, adaptation activities should be flexible in responding to changing needs and robust under various uncertain conditions (Adger et al. 2005; Sterrett 2011). Addressing uncertainty and developing flexible adaptation options require methodological support, training, and sharing experiences at different levels involving a variety of stakeholders (GERES 2012). The Climate Change Adaptation (CCA) project, led by the Watershed Organisation Trust (WOTR), aims to provide project beneficiaries multiple sources of income to address adaptation to uncertain climates (see case study in section 4.3).

- **Ensures community ownership of the project**. Adaptation literature indicates that if the community in which the adaptation activity will be implemented does not participate in its design, it will be difficult for the activity to be successful or to scale (Sterrett 2011). Ownership could be developed by integrating traditional adaptation methods with new methods and by giving voice to communities and helping them take part in the project. Equitable participation by local communities helps adaptation activities to become sustainable and relevant to the context in which they are applied (Adger et al. 2005). WOTR, for instance, is enhancing community ownership of adaptation projects by engaging farmers in discussions about crop diversification as an adaptation strategy (see case study in section 4.3).

2. Is the adaptation activity ready for scaling?

Figure 2 shows six stages of scaling readiness and their relationship to levels of evidence and replication risk (World Bank 2003). A project usually starts at a pilot stage, where

there is minimal objective evidence that the activities in the project benefit people and where there is high replication risk. Next is the promising stage of scaling, where evidence is based on anecdotes and testimonials; but the replication risk is still high because there is no proof that the activities benefit people in other settings. After the promising stage is the model stage, where there is evidence that the activities are beneficial based on project evaluation; there is medium replication risk here because of some proof that the project provides benefits. The good practice stage offers clear evidence that the project is beneficial through several evaluations and shows low replication risk because the project provides benefits in multiple settings. The next stage is the best stage, where there is evidence of impact in many different settings, through meta-analysis and expert reviews, and there is limited replication risk. The final stage is policy principle, where the project is beneficial and impactful in multiple settings with almost no replication risk, according to the scientific assessments of the project. At this stage, lessons from the project can strongly influence policy. The progression from pilot to the policy principle stage of scaling is depicted in figure 6 below.

An activity or a project slowly moves from a pilot to a policy principle. The transition between stages depends on the particular path the scaling process takes, the interaction between actors involved in the scaling process, and the conditions under which scaling occurs. There may also be instances where an activity can contribute to policy reform before reaching the policy principle stage. For instance, if various parties in the scaling process agree that there is enough evidence at the good stage of scaling and that the replication risk is small enough, lessons from the good stage of scaling can reform policy before the project reaches the best stage of scaling. Therefore, the progression from a pilot to a policy principle is not always rigid and linear.

What scaling pathways are possible?

Centralized scaling

The main agent of scaling within a centralized scaling pathway is the national government. Figure 10 shows one of the pathways a national government can take to scale a project. Other pathways for centralized scaling are possible, marked by different intermediate points, but they all begin with action by a central government actor.

In this pathway, the national government launches a national scheme with a presidential decree/parliamentary action (point A1). The government pilots the national scheme in a chosen community (point B). Lessons learned from the pilot phase may affect some subnational institutions at the meso level (point C). Changes at the meso level impact the national level, culminating in changes in policies, legislation, and monitoring and evaluation (M&E) systems, as well as increased accountability (point A2). This cycle continues with replications in other localities (points B1, B2, and B3) through the process of horizontal scaling, which leads to improvements in livelihoods and permanent changes at the local level. Horizontal replication leads to further strengthening of institutions and national-level policies and structures (point A3) through vertical scaling. In this situation, a pilot at point B rapidly transitions to influencing policy in a short amount of time.

While centralized scaling has been successful, it can also be very top-down. Actors at the national level may impose regulations and targets on a community. Although this may make the scaling process efficient and mobilize communities, it can also manipulate communities against their will. A centralized pathway may not be sustainable without community support and consultation (IIRR 2001).

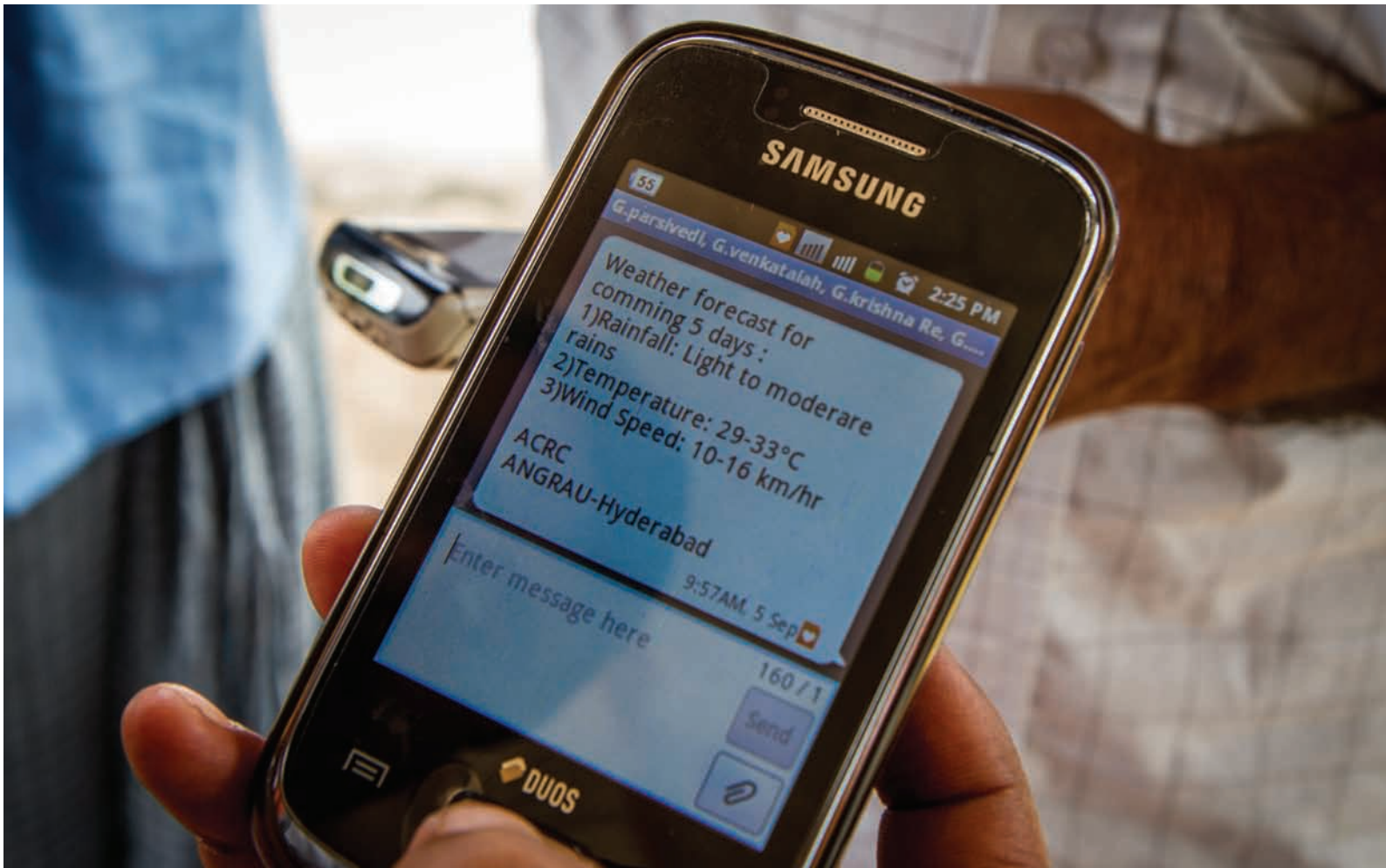
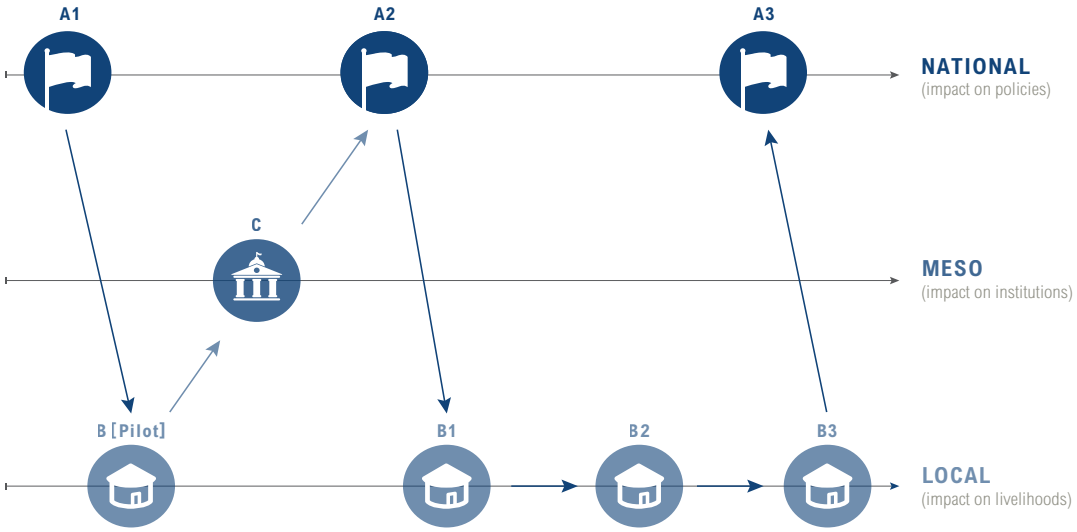


Figure 10 | **Centralized scaling pathway**



Note: Adapted from UNDP 2013

Multi-actor scaling

Scaling involves multiple actors and, in some cases, multiple actors may drive the process. In this situation, there is no one dominant actor.

For instance, as shown in figure 11, once a project led by an NGO starts to benefit many people, lessons from the pilot (point B) are mainstreamed into existing processes by meso-level institutions (point C1). At the meso level, district-level decision makers play a leading role in initiating policy change. Policy changes at the meso level leads to changes or formulation of policies at the national level (point A1) through vertical scaling. The government at the national level reforms policies, which then has effects on policy and practice at the local level and which later supports horizontal replication at the local level (points B1, B2, and B3 at the local level). Lessons learned from replication then leads to structural improvements in institutions (point C2) led by district-level decision makers before finally becoming a policy principle at the national level (point A2) through vertical scaling. While the activity scales from the local to the national, back to local, and finally up to the national level, actors from the three different scales play key and equal roles to help scale the activity.

NGO-driven scaling

Scaling of adaptation activities and projects mostly happens at the local level and is primarily initiated by NGOs. Figure 12 shows that an innovative practice by an NGO from the pilot phase (point B) is adopted by other communities/sub-districts through horizontal scaling. This may happen in a decentralized environment where agencies at the subnational level have more power or authority to implement changes in public services delivery (points B1, B2, and B3). The cycle repeats itself, yielding policy reforms at the meso and national levels through vertical scaling (points C and A).

This pathway can follow two distinct approaches: singular expansion by an NGO or decentralized replication by several NGOs.

Singular expansion occurs when a single NGO dominates the horizontal process: the NGO continues to implement adaptation activities, which also helps to expand its own presence in a particular landscape. Here, the motivation is both expansion of adaptation activities and the NGO's own presence. In this situation, a single NGO is the central agent scaling activities at the local level. The NGO does not share information or knowledge with other NGOs or local actors because it wants to maintain control and power over the scaling process and landscape. In other situations, NGOs may support decentralized replication of adaptation activities by directly or indirectly sharing information with other NGOs. In this situation, multiple NGOs play important roles in replicating the same adaptation activity in various landscapes.

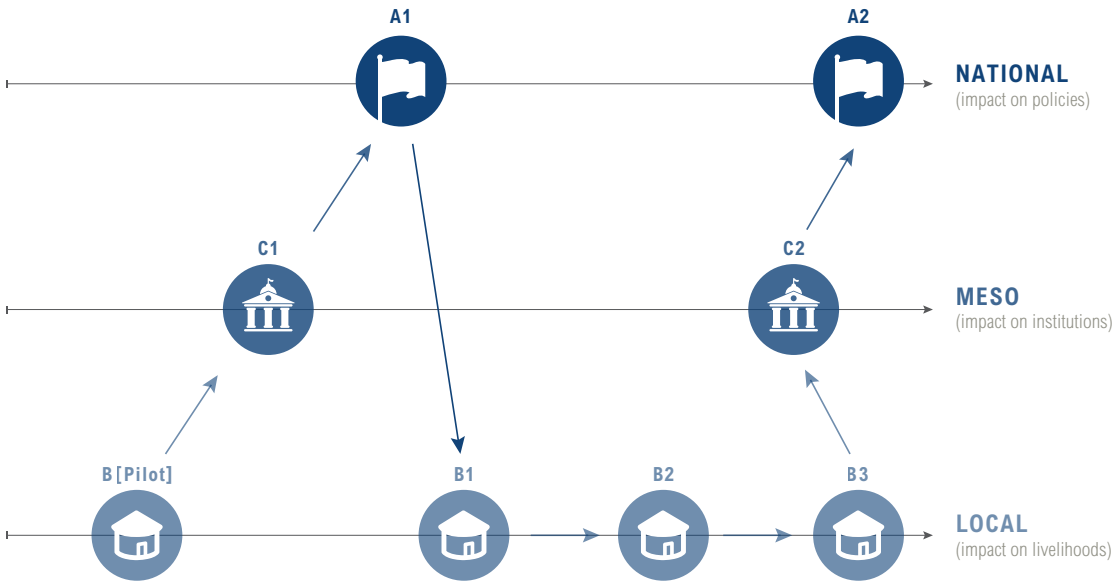
Whether it is a case of singular expansion or decentralized replication, NGOs may be reluctant to hand over the project to local communities when scaling. Maintaining control over the project can help to protect the NGO's own existence. NGOs may also believe that local communities do not have the capacity to sustain implementation of adaptation activities. Finally, NGOs may believe they have not achieved policy reform and, therefore, feel the need to sustain their own presence. For these reasons, NGOs dominate scaling efforts.

Spontaneous scaling

In some cases, scaling is "spontaneous." When individuals replicate an innovation or activity informally and without deliberate guidance from formal actors such as the government, spontaneous diffusion occurs (WHO 2010). Figure 13 shows that spontaneous horizontal diffusion occurs primarily at the local level. It occurs if people know of an innovative activity, demand it, and do not wait for a formal scaling process with the help of the government or NGOs to benefit from the said innovative activity. Here the agents of change are citizens.

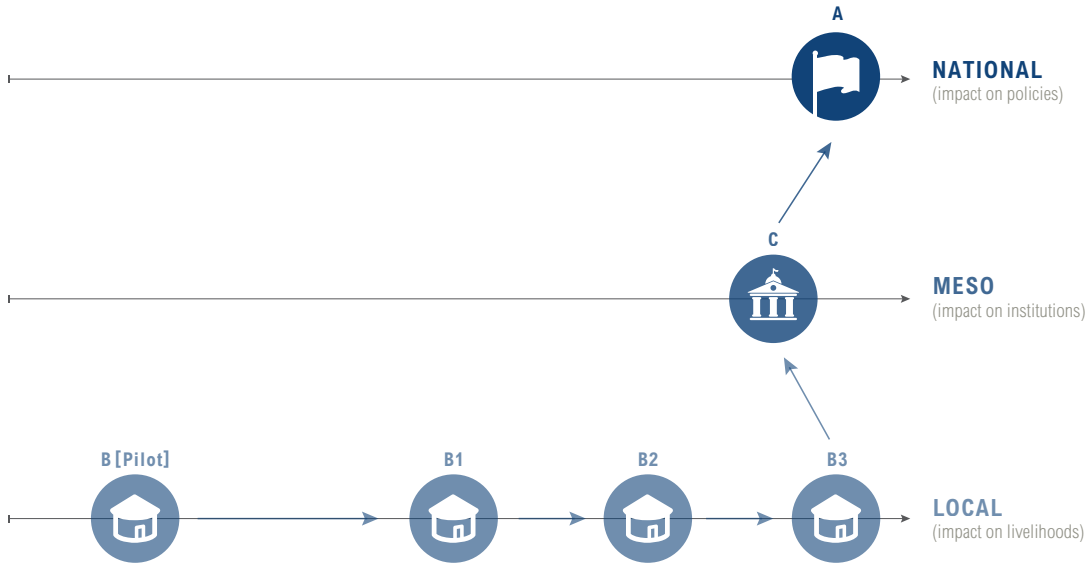
On the one hand, spontaneous diffusion and scaling may lead to incomplete replication of the innovation. Incomplete replication prevents many people from benefiting from it since this process

Figure 11 | **Multi-actor scaling pathway**



Note: Adapted from UNDP 2013

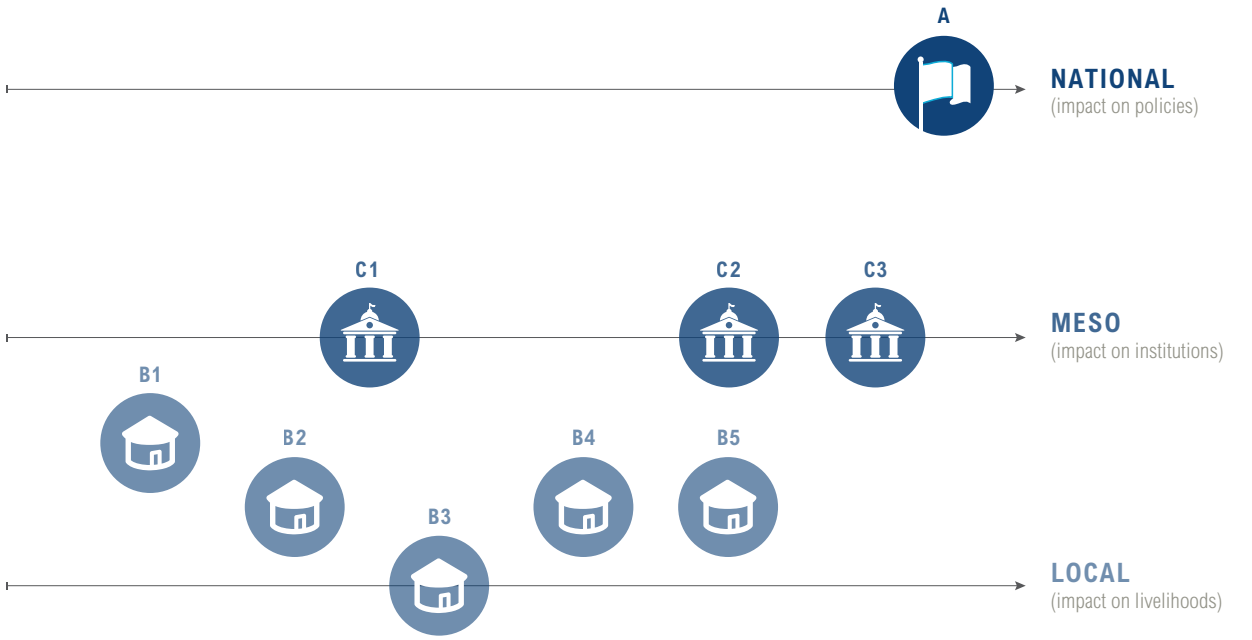
Figure 12 | **NGO-driven scaling pathway**



Note: Adapted from UNDP 2013

is not controlled and no formal, accountable agency (i.e. state government) exists to ensure complete replication. It is difficult to determine whether the innovation is beneficial since no formal and standardized way exists to determine impact. It is also unclear if and how spontaneous scaling triggers vertical scaling. The way in which spontaneous scaling occurs and how it travels horizontally and possibly vertically is not yet fully understood. Figure 10, however, suggests a possible pathway where a citizen (point B1) adopts an innovation and, by word of mouth, spreads the innovation to others (points B2 and B3). Because the innovation is popular, meso-level actors try to scale the use of the innovation (point C1) but, at the same time, the innovation is adopted organically by other citizens (points B4 and B5). At this point, meso-level actors continue to formally replicate the use of the innovation (points C2 and C3) at the state or district level until it changes policy at the national level (point A1). In figure 10, arrows have not been used to connect the actors in all three scales as there is no clear sequence as to how an innovation will scale, because the process of scaling is not formal or controlled.

Figure 13 | **Spontaneous scaling pathway**



Note: Adapted from UNDP 2013

What conditions act as enabling factors or barriers for scaling?

RESOURCES

Financial resources

Availability of financial resources strongly affects the scaling of a project or activity. In order for scaling to occur, funding agencies must be interested and willing to fund it. Financial resources may also depend on the political will of state- and national-level policy makers to influence financial investments from funding agencies so as to scale projects at the local level (Uvin 1995). However, even with initial finances and demand for scaling in place, the high fiscal cost of scaling over time could be a barrier to success. Costs will need to be reduced and recovered over time, and a sustainable source of funding secured (Cooley and Linn 2014). Therefore, it is not possible to scale adaptation activities without considerable funding. Financial resources influenced the scaling of drought adaptation activities in Andhra Pradesh (case study in section 4.1) and led to various technological innovations that boosted adaptive capacity in four states (case study in section 4.2), where the lack of funding was a scaling constraint.

Information on the financial costs of scaling is not readily available except in the health and education sectors, where services have been scaling over many years. In Turkey, for example, scaling an early education initiative to the national level costs $17 million (Sirali et al. 2015). It is unclear how much it costs to finance scaling at the community level (from one community to others) or the national level, especially for adaptation projects. This may be partly because there is no emphasis on tracking budgets for scaling. However, there are several options for keeping costs low or sharing the costs of financing, as described next.

Co-financing of projects by community members and the government or NGO that implements a project has shown to be an enabling and sustainable method to finance scaling (Binswanger et al. 2009, 2003). Co-financing not only creates the additional funds needed for scaling, but it also allows local-level actors to have a stake in the process of scaling adaptation activities. This type of "matching grant" allows the government or NGO to create an incentive for communities to take ownership of the project (Linn 2013). Having a stake in the process also helps to develop the commitment needed to scale and sustain activities. Budgetary allocation and subsidies provided by the government could lead to financial incentives to scale (Linn 2013). Finances could also be available through the private sector (Vaughan et al. 2013). The Unnati case from Rajasthan (case study in section 4.4) demonstrates the effectiveness of co-financing adaptation projects where project beneficiaries provide 25 percent of the project costs to support drought risk reduction activities and gain ownership over the project.

Organizational plan and institutional capacity

To scale adaptation projects in a deliberate and planned manner, organizations involved in scaling need to incorporate the intention to scale into their vision and mission. They also need a defined theory of change (Bradoch 2003) that identifies a pathway through which an adaptation activity, if proven to provide benefits, could scale horizontally or vertically. It is important to define a vision beyond the immediate pilot stage so that the design of the pathway and the associated M&E structure reflects the conditions that will make scaling possible (Cooley and Linn 2014). If a vision of the pathway beyond the pilot does not exist in the theory of change, there is a risk that conditions that could affect scaling will be overlooked, creating challenges down the road.

Institutional capacity among project staff is essential for scaling. In many cases, implementing organizations lacking human resources cannot manage an enlarged program (Hartmann and Linn 2007; UN 2005). For instance, a community watershed program could expand to include agricultural marketing. This would mean the organization's staff needs to have skills in watershed management and agricultural marketing. Project staff may not have the capacity needed to design, plan, and coordinate a project's expansion (Kohl 2012; UNDP 2013). The lack of absorptive capacity and incentives to scale within an organization leads to "short-termism" and fragmentation of projects (Binswanger et al. 2009).

For projects to scale, project implementers need to assess where capacity can be built among staff and work with funding agencies to increase capacity at the project level. Incentives through contractual obligations or reward systems among project staff for helping with the scaling process can increase the institutional capacity to take on larger projects (Linn 2013). All case studies in this report demonstrate the importance of having human resources within the organization as an enabling factor to scale adaptation projects. The case study in section 4.3 in particular suggests the importance of building capacity of officials in line departments, NGOs, research organizations, and the youth in target villages for successful scaling to take place.

Champions with strong visions of how scaling should happen can rally the internal support needed for scaling (Subramanian et al. 2011). Leadership within the implementing organization is a critical factor for moving the project from a pilot to the subsequent phase. Charismatic leaders who are "endowed with a vision, persistent in their efforts, well connected to stakeholders and constituencies, and have the ability to command respect and guide people" (Hartmann and Linn 2007: 3) can enable scaling if they believe in the need to do so. Leaders can be from within the project, or can also be state- or national-level policy makers and funding agencies who believe that a particular adaptation activity needs to be scaled. Although leadership is important, if the pilot program's success depends on a single individual, efforts to expand the program may not survive (IRH 2013).

Time

Scaling both horizontally and vertically can take decades, depending on the scope of scaling efforts (Hartmann and Linn 2007). Time is particularly a tricky factor for adaptation projects. For adaptation projects to address long-term behavioral changes, the time horizon for the projects needs to be long. Funding agencies may shift priorities, governments may change, NGOs may lose funding, and agency managers and staff may turn over. Therefore, successful scaling of long-term adaptation projects will require long-term commitment from various stakeholders, and financial and political incentive to support scaling.

Technology that supports diffusion of adaptation activities

Access to technology can affect scaling of adaptation activities. Several technological advances in the field of agriculture have led more farmers to adopt technologies that produce greater yields under climate change. Research institutes, such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), have developed "climate-ready cultivars" that are adapted to heat stress and high soil temperature suited for dryland areas (Jat et al. 2012). In collaboration with private and public sector seed companies, ICRISAT commercialized hybrid pigeon pea that is heat tolerant, which more and more farmers are now using. Advances in internet and communication technologies have also helped people to adapt to climate change, as the case study in section 4.2 demonstrates. These technologies are scaled through a concerted effort by the research institutes that develop them, the funding agencies that support the research institutes, and governments that use the technologies in a centralized or decentralized manner. Still, it may be difficult for potential users to access technology. For instance, cell phones or drought-tolerant seeds may be too expensive for some farmers.

PARTNERSHIPS

Partnerships between NGOs and government agencies

State- and national-level policy makers play an important role in both horizontal and vertical scaling (WRI 2008). In many cases, because government agencies operate throughout a country and can provide financial support for larger programs that have a greater reach, government agencies are in a position to scale activities compared to NGO-driven projects (Reid and Schipper 2014). For successful scaling to occur, projects must be able to withstand changes in the political climate. To embed the project in political systems, project personnel need to have good working relationships with the government, as well as opposition parties, think tanks, civil society, and local champions. Strengthening relations with the government and other actors is a long process that requires NGOs to create constituencies and mobilize stakeholders willing to support the expanded programs (Hartmann and Linn 2007).

Many NGOs find it "risky and difficult" to engage with government agencies when scaling vertically. For instance, the Self-Employed Women's Association (SEWA), an NGO that focuses on village-based rural livelihoods in India, withdrew its projects from Gujarat because of political challenges. As SEWA scaled its projects horizontally and vertically, it perceived that state government officials were using its network for political purposes. When SEWA resisted, government grants were withheld (Desai and Joshi 2012).

Because of such difficulties, many NGOs scale adaptation activities and projects indirectly (Uvin and Jain 2000). Indirect vertical scaling occurs when government agencies or private enterprises take over an NGO's operations after the NGO has demonstrated its potential. Alternatively, in a joint venture, an NGO works with a business or a government agency to carry out a project that both are interested in but neither could, or wishes to, execute alone. The NGO scales its direct impact insofar as it delivers services to larger numbers of people; at the same time, it has indirect impact to the extent that it gets its partners to undertake new activities.

The collaboration between the state government of Andhra Pradesh and the non-governmental Centre for Sustainable Agriculture to replicate successful pest control activities demonstrates how government support can enable scaling (Rajasekhar et al. 2013). The success of this collaboration rested on shared objectives and a high level of trust that helped to "dispel fears of being co-opted or one party having exclusive control" (Rajasekhar et al. 2013). The partnership with the state government expanded the program's reach and influenced policy at the state and national levels, leading to vertical scaling of practices. The case studies in this report all demonstrate strong partnerships

between NGOs, private sector, government research organizations, self-help groups, and farmers groups.

Private partnerships

Partnerships between the private sector and research organizations, communities, and governments can lead to significant scaling of services. For instance, Consultative Group for International AgricultuesearchCGIAR's International Maize and Wheat Improvement Centre, in partnership with Monsanto and Badische Anilin- und Soda-Fabrik (BASF), has developed drought-tolerant maize cultivars that produce 20 percent to 50 percent higher yields under drought conditions than other maize cultivars (Varshney et al. 2011). Monsanto provided proprietary germplasm, advanced breeding tools and expertise, and drought-tolerant transgenes developed in collaboration with BASF. This partnership led to a production increase from 700 metric tons in 2009 to 30,000 metric tons in 2011–2012 to help farmers adapt across thirteen African countries. The case study in section 4.2 demonstrates the strong partnership between an NGO, farmers, data centers, and Tata DOCOMO, a private mobile service that provides weather information to farmers.

Networks

Networks are "the glue of scalability, allowing the efforts of individual organizations in widely separated communities to coalesce into something with broader applicability and impact" (WRI 2008: 15). A network allows its formal or informal members to partner and act as a forceful entity by pooling resources. Connecting activities to networks enables the scaling process to be efficient and brings benefits to project beneficiaries. In order to scale horizontally and build absorptive capacity, project managers need to assess the types of networks that exist. When scaling vertically, project managers can assess the institutional networks that exist between the local and national levels. Use of vertical networks links communities to government agencies and the private sector, helping to build political support, deal with bureaucratic obstacles, and connect to technical and financial support for scaling (WRI 2008).

An example from Fiji illustrates how organizing communities into a network of partners enables them to have greater access to decision makers and greater impact on policy. The Fiji Locally Managed Marine Area Network works to protect customary marine tenure and promote local management and monitoring of fisheries. It provides a forum for members to share methods to manage marine areas and monitor results (LMMA 2005). Through peer learning, members improved marine management systems, increasing their income while protecting coastal fisheries. Network communities shared lessons with government officials, which led the Ministry of Fisheries to adopt the network's approach and devote a division of the Fisheries Department to coordinating with the network to promote inshore conservation. The ministry's commitment also influenced the neighboring island nations of Palau and Federated States of Micronesia to commit to protecting inshore waters. In India, the India Revitalizing Rainfed Agriculture network plays an important role in creating a platform to bridge knowledge and advocacy gaps. As the case study from Andhra Pradesh in section 4.1 shows, this network can help support scaling efforts.

LOCAL CONTEXT

Cultural and environmental factors

Understanding the local cultural and environmental context is critical for successful adaptation and horizontal scaling (Binswanger et al. 2009; Linn 2012). Cultural and environmental factors can either help or hinder the replication of projects, depending on circumstances (Samoff et al. 2013). For instance, project managers found it easier to scale rural water projects in the Himalayan area of Swajal in Uttar Pradesh, India, than in the lowlands of Bundelkhand, partly because the perennial streams and springs in Swajal provided cheap water, whereas expensive deep tube-wells or hand pumps had to be installed in Bundelkhand (Binswanger and Aiyar 2003). Furthermore, caste divisions posed greater social obstacles in Bundelkhand than in the Himalayan area, which affected the extent to which project beneficiaries could actually benefit from the project in Bundelkhand. Similarly, the case study in section 4.4 describes how caste politics and poor literacy levels among the lower caste populations affect scaling.

Community ownership and absorptive capacity

Local and community-driven approaches to scaling often have better outcomes than centralized approaches (Binswanger-Mkhize and Rget 2012). They work best when embedded in decentralized government and financial structures, and involve various stakeholders. To involve the community, project implementers need to assess a community's interest and ability to participate in the adaptation activity, available time, financial situation, and other inputs they can invest into the scaling process (WRI 2008). If these inputs are not available, it will be difficult for adaptation projects to expand. Giving communities' ownership and involving them in the planning, budgeting, management, and evaluation of a project create the incentives needed for community members to remain engaged in scaling of adaptation activities (Linn 2013).

To encourage community ownership and scaling to a different location, project managers may need to build a community's "absorptive capacity" to accommodate a new, scaled project. Building absorptive capacity entails developing a community's capacity to mobilize a unified voice, manage and monitor natural resources, and benefit from either the pilot project or the project that has expanded horizontally (WRI 2008). For projects to build absorptive capacity, project implementers may have to rely on funding agencies for additional funding to build capacity, as well as local-level governments to mobilize communities. Developing the ability to absorb a pilot or a scaled product allows communities to embrace a shared project goal, negotiate an action plan to attain it, and take ownership and control over their adaptation activities. For example, WOTR in India is building the absorptive capacity of farmers by establishing farmer field schools to educate farmers about crop diversification as an adaptation strategy (see case study in section 4.3).

KNOWLEDGE MANAGEMENT

Monitoring and evaluation

Monitoring and evaluation (M&E) is an important component of knowledge management and an effective scaling tool. Monitoring is an ongoing process of tracking and reviewing activities, their results, and the surrounding context. The aim is usually to make immediate adjustments to activities if deviations from objectives, targets, or standards are detected (Spearman and McGray 2011). Monitoring also generates information that can be used for in-depth evaluations of projects or programs. Traditional M&E systems have focused primarily on achieving project-specific goals. For scaling, such project-focused M&E systems need to expand beyond the project to measure whether and how the project supports the overall scaling process while keeping the various conditions that may affect scaling in mind (Linn 2012). Example of a strong M&E system can be found in the case study in section 4.2, where the Indian Agriculture Research Institute (IARI) developed an M&E system to help scale technologies to cope with drought.

Learning and uncertainty

Within the field of CCA in particular, scientists are uncertain about the scale of climate change impacts, as well as how climate uncertainties interact with social, ecological, economic, and political factors at the local scale (Ranger 2013; Stainforth et al. 2007). Uncertainty surrounding monsoon forecasts is a particular challenge in India (Lal et al. 2001). Not having an exact idea of what the future will look like makes it difficult to plan for scaling of adaptation activities. However, a knowledge management system within projects can help those involved in the scaling process learn and understand uncertainties as the project scales over time. Furthermore, a knowledge management system tied to an M&E system strengthens learning about

BOX 2. ADAPTATION MONITORING AND EVALUATION

As more and more implementing agencies of watershed development projects incorporate specific adaptation measures into their projects, it becomes increasingly important to understand whether these measures and projects are actually helping communities adapt to climate change, as well as improving their livelihoods and improving ecosystem health. Adaptation M&E is an important and useful tool to asses if community-based restoration and agricultural projects like watershed development can help shape successful adaptation efforts and to understand both short- and long-term success of watershed development projects. The World Resources Institute (WRI) collaborated with WOTR to develop recommendations for establishing an adaptation M&E) or tracking system for WOTR, while considering recommendations that could be applied to other implementing organizations of rural restoration approaches in India and beyond. Together, WRI and WOTR are developing a joint report that will (i) present findings from a literature review on adaptation M&E guidance and frameworks and distill key challenges for tracking adaptation for community-based organizations and (ii) discuss the process and lessons learned from designing an adaptation M&E system for WOTR. This working paper represents an initial phase of work so it does not explore the operationalization of an adaptation tracking system by WOTR, but, rather, provides initial recommendations for an adaptation tracking system and outlines how these recommendations can be applied by other implementing agencies (Gray et al., forthcoming).

uncertainty so that uncertainty can be monitored as scaling progresses and addressed whenever possible. Therefore, M&E systems need to go beyond assessing the impact of an activity to supporting learning not only about what has worked and what has not, but also about uncertainty so that it can be addressed during the scaling process. M&E systems need to be designed to support iterative and interactive learning within an organization and with partners who help to scale (Cooley and Linn 2014). The case study on droughts in Andhra Pradesh highlights political uncertainty as an issue that needs to be considered in addition to climate uncertainties (in section 4.1).

Sharing lessons

Lessons from M&E systems can be shared informally through strong partnerships and networks between institutions, or formally through knowledge exchange platforms where stakeholders from different scales meet (Stott and Huq 2014). Formal and informal lesson-sharing through knowledge exchange platforms allows project managers to apply lessons from one site to another, and vulnerable communities can learn how others are adapting to climate change (Stott and Huq 2014). Sharing lessons on uncertainties or the scaling process that may or may not work across organizations collectively allows for more effective scaling. It can also attract additional financial and administrative support from funding agencies and policy makers to support scaling. The case study in section 4.4 demonstrates the importance of sharing lessons.

The adaptation scaling framework presented here has been applied to the case studies in Chapter 4. The projects selected for further research are presented as four case studies in Chapter 4. The case studies in Chapter 4 apply the four parts of the adaptation scaling framework to the process of scaling adaptation activities.

ANNEX B: METHODS

The authors used the following methodology in this report:

Choice of Projects

The authors first undertook a literature review of the various adaptation interventions currently underway in the arid and semi-arid areas of India by using secondary sources. The authors found a range of projects in the literature. Expert judgment from a team member, who has over seventeen years of experience in agriculture, guided the development of five categories to organize the wide array of interventions identified in the literature. The five categories chosen were crop improvement, soil management, farm management, water conservation, and water provision,. These categories are further described in table 2. However, the authors found that there is limited information available through secondary sources about on-the-ground practices.

To further develop their assessment of current interventions, the authors interviewed individuals associated with adaptation projects. Interviewees were selected on the basis of a combination of gaps identified in the literature and expert judgment. In addition, availability of interviewees was a major factor in the choice of projects. The authors contacted fifty of the organizations that were identified through the literature review to ask to speak with one or more staff member working on relevant projects. The authors interviewed a total of twenty-nine people from twenty-one organizations. Of the organizations interviewed, sixteen had implemented projects and five were research institutes whose research informs on-the-ground project implementation. The organizations and interviewees are listed in Annex C: List of Interviewees. The interviews are divided into three categories:

AGRICULTURAL STRATEGIES	CORRESPONDING ACTIVITIES
Crop improvement	Breeding of stress tolerant varieties (stressors include elevated temperature, drought, salinity, and rise in CO2 concentration)
Soil management	Use of organic fertilizers and compost Crop nursery Zero tillage, crop rotation, residue cover of soil Vegetation barriers
Farm management	Crop diversification Low- or no-tillage agriculture Integrated pest management Tree planting to provide shade and fodder for livestock Laser land leveling Integrated livestock and fish farming Growing stress-resistant crops Use of organic sources of nutrients, avoiding/minimizing use of chemical pesticides Agroforestry Planning farming activities to increase agriculture biodiversity Agro-horticulture activities Modification of crop calendars, that is timing/location of cropping activities Tank silt application in farms
Water conservation	Rainwater harvesting infrastructure such as infiltration ditches, planting pits, furrows, tied ridges to reduce rainfall runoff Construction of checkdams, ponds, tanks, and bunds Construction of brick- or concrete-lined channels to reduce water loss during transport Crop and soil management activities to conserve moisture and reduce water requirement Drip irrigation, sprinkler irrigation, earthen pot irrigation Cover crops and shelter belts
Water provision	Surface groundwater management system

scoping, deep dive, and policy-maker interviews, as described next.

Scoping Interviews

The first "scoping" set of interviews (questionnaire in ADid your plan to scale the adaptation practice go according to plan? Why or why not? (Interviewer can probe by asking questions on the conditions for scaling based on findings from the previous questionnaire.)) was conducted with twenty-nine interviewees in twenty-one projects to expand on the literature review. These interviews were conducted between November 1, 2014 and November 30, 2014. The authors created the questionnaire with two objectives in mind. First, they hoped to help the study team gather additional information about the adaptation interventions currently implemented in the rainfed areas of India. Second, they sought to understand the enabling factors and barriers for scaling these interventions, the trade-offs between them, and the process and potential of scaling the interventions. Thus, the twenty-one projects were assessed for the first two parts of the framework, that is, good practice indicators and scaling readiness.

The scoping questionnaire focuses on the conditions for scaling and the authors analyzed the interview responses according to the table outlined in the adaptation scaling framework (Annex A: Detailed Description of the Adaptation Scaling FrameworkG). For each question in the scoping questionnaire (Annex D) the authors assessed whether the project currently met the range of conditions for scoping. For example, one question was, "What kind of contextual factors (environmental/social/economic/political) do you think will affect expanding the project and informing decision makers?" If the project had considered this contextual factor, they would be given a check mark. Annex G shows the list of projects and the conditions for scaling that they currently meet, according to the interviewees.

Deep Dive Interviews

To choose four deep dive interviews from the set of twenty-one project interviews, the authors considered the range of conditions for scaling met by the projects. The authors were interested in choosing a diverse set of case studies—one that met only a few conditions for scaling, one that met some, and one that met several.

The authors included four other criteria in their choice of deep dive interviews.

- Whether the projects specifically focused on adaptation
- The range of stages of scaling
- The range of conditions for scaling met by the project
- Whether the project exhibited a clear scaling pathway
- The quality of the description of the project in the scoping interview
- The availability of key project personnel for a second round of deep dive interview

The authors conducted the second set of "deep dive" interviews with four interviewees chosen through the process outlined earlier. These interviews were conducted between December 10, 2014 and December 16, 2014. The deep dive questionnaire (Did your plan to scale the adaptation practice go according to plan? Why or why not? (Interviewer can probe by asking questions on the conditions for scaling based on findings from the previous questionnaire.)) focused on the process of scaling. The objectives of the questionnaire were to gather detailed information about the practice to be scaled and the plans for scaling, and to examine the process and experience of scaling thus far. The deep dive interviews helped illuminate the "good" practices that are in the process of being scaled, and the lessons learned on whether and how the practice was successfully scaled. Thus, in addition to "good practice indicators" and "scaling readiness," the four case studies were assessed for the remaining two parts of the adaptation scaling framework, namely "scaling pathways" and "conditions for scaling." These four deep dive interviews have been written up as case studies in Chapter 4.

Policy Maker Interviews

The third set of interviews was conducted with policy makers. The "policy-maker" questionnaire (Annex F: Policy-Maker Interview Questionnaire) is much shorter than the other two questionnaires and more general. The objectives of the policy-maker interviews were twofold. First, they sought a high-level view of adaptation interventions in rainfed areas of India in order to ensure the authors did not miss any important adaptation activities. Second, the policy-maker questionnaire aimed to assess policies in place to support the scaling of good practice. The authors interviewed six policy makers; information from these interviews has been incorporated throughout the report, but is especially integrated into Chapter 3, on the current status of rainfed agriculture in India.

Limitations of Methodology

The conclusions, recommendations, and analysis presented in this report were limited by the information available through secondary sources and the availability of organizations for interviews within a specific period. Although the desk research and interviews strive to present a holistic picture of current adaptation interventions in the rainfed agriculture sector in India, it is possible the authors have overlooked some interventions.

Time was also a constraint when conducting these interviews; the interviewers had one month to conduct the first round of scoping interviews and one week to conduct the deep dive interviews. Owing to time constraints, this report primarily focused on the views of project implementers and some policy makers. It was not possible to interview the farmers who helped to implement adaptation projects. However, the project implementers interviewed for this report work closely with farmers, and reported on their perception of farmers' views when responding to interview questions. Because of these constraints, information on the potential for scaling adaptation practices may be limited.

Given the qualitative nature of this research, the authors relied on a primarily subjective methodology for selecting the deep dive interviews. The deep dive interviews were selected according to the author's best judgment, as described earlier.

Another limitation of this report is the inherently complex and diverse nature of adaptation to climate change. Few generalizations can be made, especially within a geographically and socio-economically diverse country such as India. Additional research is required if we are to fully understand which adaptation

ANNEX C: LIST OF INTERVIEWEES

Scoping Interviews

1. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Somya Bhatt, Indraneel Ghosh, and Peter W. Saile
2. Development Alternatives (DA): Harshita Bisht and Mayukh Hajra
3. World Wide Fund for Nature (WWF): Murli Dhar
4. The Energy Research Institute (TERI): Suruchi Bhadwal and Nutan Kaushik
5. Cohesion Foundation: Rajesh Kapoor
6. Centre for Environment Education (CEE): Atul Pandya and Ramesh Savalia
7. Action for Social Advancement (ASA): Shaji John
8. Action for Food Production (AFPRO): Pallab Dutta
9. Public Affairs Centre (PAC): R. Suresh and J. Jangal
10. Ashoka Trust for Research in Ecology and Environment (ATREE): Srinivas Badiger and Milind Bunyan
11. Unnati: Binoya Acharya
12. Commonwealth Scientific and Industrial Research Organisation (CSIRO): Uday Nidumolu
13. Indian Agricultural Research Institute (IARI): Naresh Kumar
14. Watershed Support Services and Activities Network (WASSAN): A. Ravindra
15. Indian Institute for Tropical Meteorology (IITM): R. Krishnan
16. BAIF Development Research Foundation: Joshua N Daniel
17. Advanced Center for Water Resources Development and Management (ACWADAM): Himanshu Kulkarni

Deep Dive Interviews

1. Unnati: Binoy Acharya
2. Indian Agricultural Research Institute (IARI): Naresh Kumar
3. Watershed Support Services and Activities Network (WASSAN): A. Ravindra
4. Watershed Organisation Trust (WOTR): Marcella D'Souza

Policy Makers/Donors

1. Mustafa Khan: SDC IHCAP Project
2. Bishwadeep Ghose: Argyhyam
3. Akhilesh Gupta: Adviser, Ministry of Science and Technology, Government of India
4. K. J. Ramesh: Adviser, Ministry of Earth Sciences, Government of India

ANNEX D: SCOPING INTERVIEW QUESTIONNAIRE

SCALING GOOD ADAPTATION PRACTICES IN INDIA

Questionnaire for Adaptation Project Implementers

Objectives
1. Gather additional information about the adaptation project/ intervention

2. Understand the presence and absence of enabling factors and barriers for scaling

Project Selection
The project selection is based on several pieces of research. It started with a review of policies and plans related to adaptation and agriculture in India. Then research was conducted on key actors and their involvement in adaptation work in rainfed agriculture. Based on the landscape review and actor analysis, a set of adaptation interventions were selected, categorized, and developed into a table. We then consulted with Vulnerability and Adaptation team members on appropriate interviewees for each intervention.

Informants
The informants/interviewees comprise project personnel who work on implementation. They range from research institution to NGO to government organizations.

A. Questions on the project
Time: 10 minutes
Overall research objective: To fill in information gaps on interventions identified through research

1. (Let the interviewee first know that you are aware of the project he/she is involved in before asking question 1). Is this the adaptation project you would like to discuss or is there another adaptation project that has higher potential for scaling that we could discuss? (Interviewer should decide on and focus on one project before continuing with the questionnaire)

2. What is the objective of your project?

3. Why did you choose to implement this specific intervention?

4. Do you feel you are achieving the objectives of this project? Why or why not?

5. Do you feel this is adequate time for implementation?

6. Any questions needed to fill gaps in information about the specific intervention.

B. Questions on assessing scaling
Time: 15 minutes
Overall research objective: To understand if the project is considering scaling of activities

7. Do you have plans in place to expand your project in different geographical areas (horizontal)?

8. Do you have plans to share knowledge and enable other actors to replicate your work (NGOs as agents)?

9. Are any non-beneficiaries (of your project) taking up the good practices that you are trying to promote in your project without your input (spontaneous)?

10. Do you plan to convey lessons learned about adaptation to decision makers at the state or national level (vertical)?

C. Questions on both horizontal and vertical scaling
Time: 20 minutes
Overall research objective: To understand how and why the project is being scaled

11. Where is the demand for expansion and informing decision makers at the state and national levels coming from?

Is there financial support to reach more people or high-level decision makers? How do you plan to use this to expand the project?

12. What kind of contextual factors (environmental/social/economic/political) do you think will affect expanding the project and informing decision makers? (Donors may shift priorities, governments may change, NGOs may not have funding, and agency managers and staff may change during this long period)

13. What kinds of communication systems do you have in place specifically to expand your project or communicate with decision makers?

14. Who do you intend to partner with to expand the project and inform decision makers? Why these partners?

15. Do you plan to use any particular networks to help you scale the project and inform state- and national-level decision makers?

D. Additional questions on horizontal scaling only
Time: 10 minutes
If the answers to questions 5, 6, or 7 are "yes" then ask the following questions also (horizontal)

16. Is there an interest among the project staff to expand the project? Is the project staff ready to expand the project considering expansion requires new skills and responsibilities?

17. Do you have an M&E system in place that will help you standardize practices as you expand?

18. If this project involves scaling the use of adaptation technology, how will the technology be diffused? What is the process of diffusion?

Or

E. Additional questions on vertical scaling only
Time: 10 minutes
If the answer to question 8 is "yes" then ask the following questions also (vertical)

19. Do you have any specific types of policy reform that you are seeking through your adaptation project? If so, what are the reforms you are seeking?

20. How are you going about integrating lessons learned from your adaptation project into political decision-making systems?

F. Questions related to climate change
Time: 5 minutes
Overall research objective: To understand how climate uncertainty might impact the scaling process

21. There are many future uncertainties that the project will have to address, one of them being climate uncertainties. Considering this project helps people adapt to climate change, do you think future climate uncertainties will affect expanding the project and/or informing decision makers? Why or why not?

ANNEX E: DEEP DIVE INTERVIEW QUESTIONNAIRE

SCALING GOOD ADAPTATION PRACTICES IN INDIA

Questionnaire for Deep Dive Interviews

Objectives

1. Gather detailed information about the practice to be scaled to assess and capture lessons learned on whether and how the practice was successfully scaled

2. Understand plans for scaling adaptation practices, and the barriers and enabling factors with regards to scaling in more detail

Once these objectives are met, the interviewer should be able to discuss the adaptation practice that was scaled, the process and pathways of scaling, and the lessons learned on scaling adaptation practices. This will help to assess whether the practice is at the innovation stage or advanced stage of scaling, and the enabling factors and barriers to scaling. Based on the analysis, recommendations will be provided on how to improve scaling of the practice.

Respondents

The respondents comprise project personnel who have extensive knowledge on practices to be scaled within their projects.

DEEP DIVE QUESTIONNAIRE

Interviewer first recaps what he/she knows about the project already (i.e. objectives, status of the project, etc). Recap is based on the analysis from the "Questionnaire for Adaptation Project Implementers." He/she then asks the respondent to verify the information for accuracy before starting the interview.

A. Questions to assess "good practice"

1. What is the specific practice you are trying to scale and why?

2. Would you say that this practice is (a–h)? Why or why not?
   - ☐ Effective so that vulnerability is reduced
   - ☐ Efficient so costs to implementation are reduced
   - ☐ Equitable so that many people benefit
   - ☐ Able to reduce vulnerability
   - ☐ Built on local ownership to create sustainability
   - ☐ Developed by multiple stakeholders
   - ☐ Flexible considering there are climate and other social, economic, and political uncertainties
   - ☐ Future looking so that practice can be applied in the long term

3. Is this evidence related to (select a–h) based on anecdotes and/or expert evaluations?

4. How do you know that this adaptation practice will be beneficial to others beyond the community in which you are implementing the practice? Did you validate this claim? If so, how? (Interviewer can probe by asking if there was an impact assessment done to assess if this is a "good" adaptation practice for scaling.)

5. How did you use this evidence to plan for scaling?

B. Questions on the process of horizontal and/or vertical scaling of adaptation practices

6. Who is the target audience for scaling?

7. When did you start thinking about scaling an adaptation practice? Why this particular time period?

8. Please describe in detail the sequence of steps you planned to horizontally/vertically scale adaptation practices based on your target audience. (Interviewer should ask about the horizontal first and then the vertical. Interviewer can probe about the role of various actors/partners in the process of scaling and scaling pathway.)

9. Did you face any uncertainties (i.e. climate, economic, social) that made it risky to scale the practice? If yes, what were they and how did you address them?

10. Did your plan to scale the adaptation practice go according to plan? Why or why not? (Interviewer can probe by asking questions on the conditions for scaling based on findings from the previous questionnaire.)

C. Concluding questions

11. What is the biggest lesson that you have learned thus far with regards to either replicating a practice or creating policy change?

12. What would you do differently the next time you try to scale an adaptation practice?

ANNEX F: POLICY MAKER INTERVIEW QUESTIONNAIRE

SCALING GOOD ADAPTATION PRACTICES IN INDIA

Questionnaire for Policy Makers

Objectives

1. To verify the types of adaptation activities in place in rainfed agriculture in India

2. To assess policies in place to support scaling of good adaptation practices

Questions

1. What are some of the most impactful activities taking place in India that address climate change adaptation in rainfed agriculture areas?

2. Do you think there is potential to scale up these practices? Why or why not?

3. What are the most significant barriers to scaling good adaptation practices in rainfed of India? Are you addressing these barriers? If yes, then how? If not, why not?

4. What are the most significant enabling factors that help scale good adaptation practices in rainfed of India? How are you promoting these enabling factors?

5. Could you recommend an organization that is trying to scale up good adaptation practice? Who is the contact person in this organization and do you have his/her contact information?

ANNEX G: PROJECTS BY SCALING CONDITIONS MET

Figure 14 shows conditions for scaling considered by each project. The conditions are categorized under heads such as resources, partnerships, local context, and other additional conditions. The local conditions present are the most common seven conditions encountered during interviews. The check mark shows presence of the condition/ its consideration by the organization while scaling/planning to scale.

Figure 14 | **Projects by scaling conditions met**

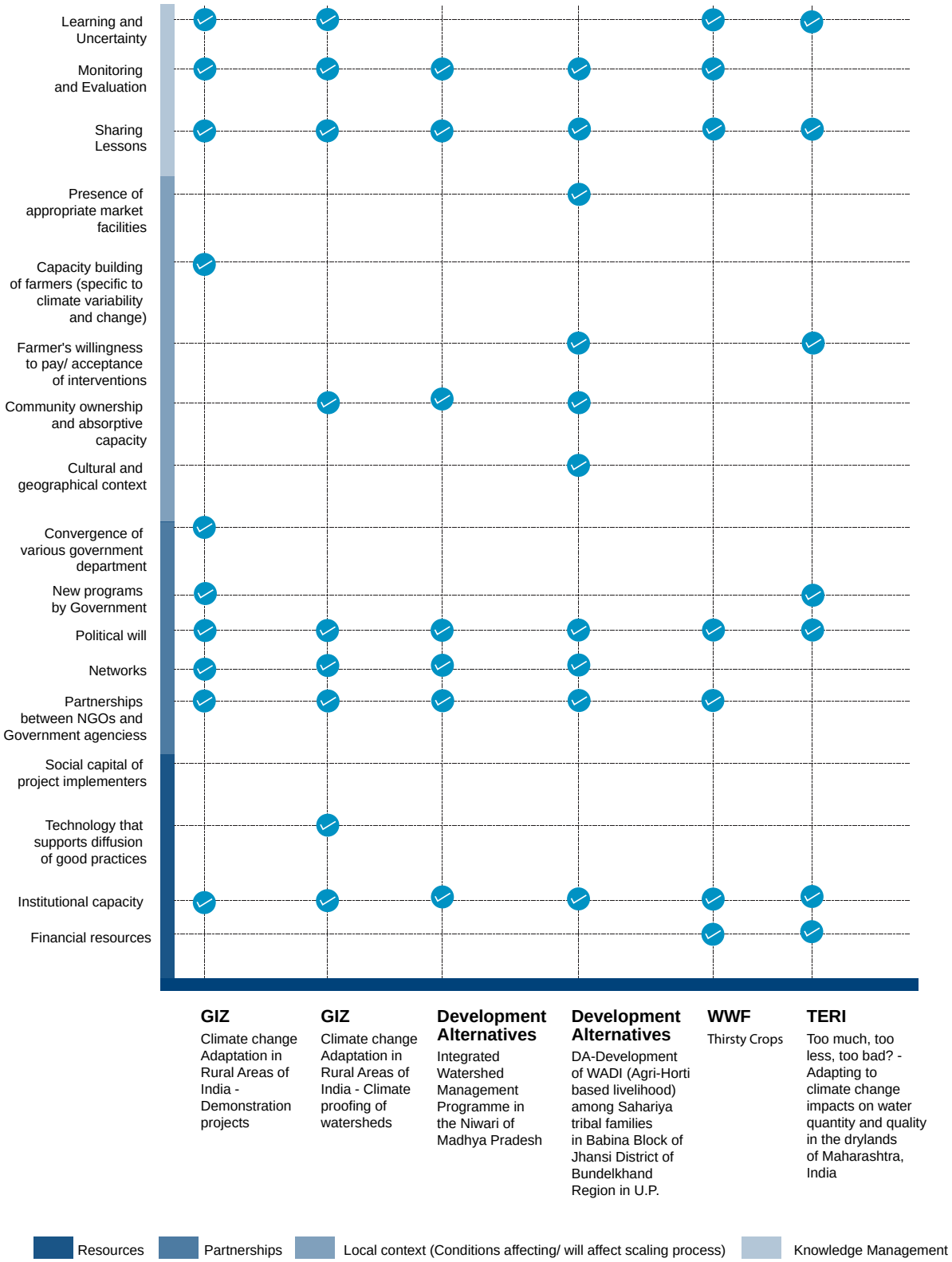


Figure 14 | **Projects by scaling conditions met**

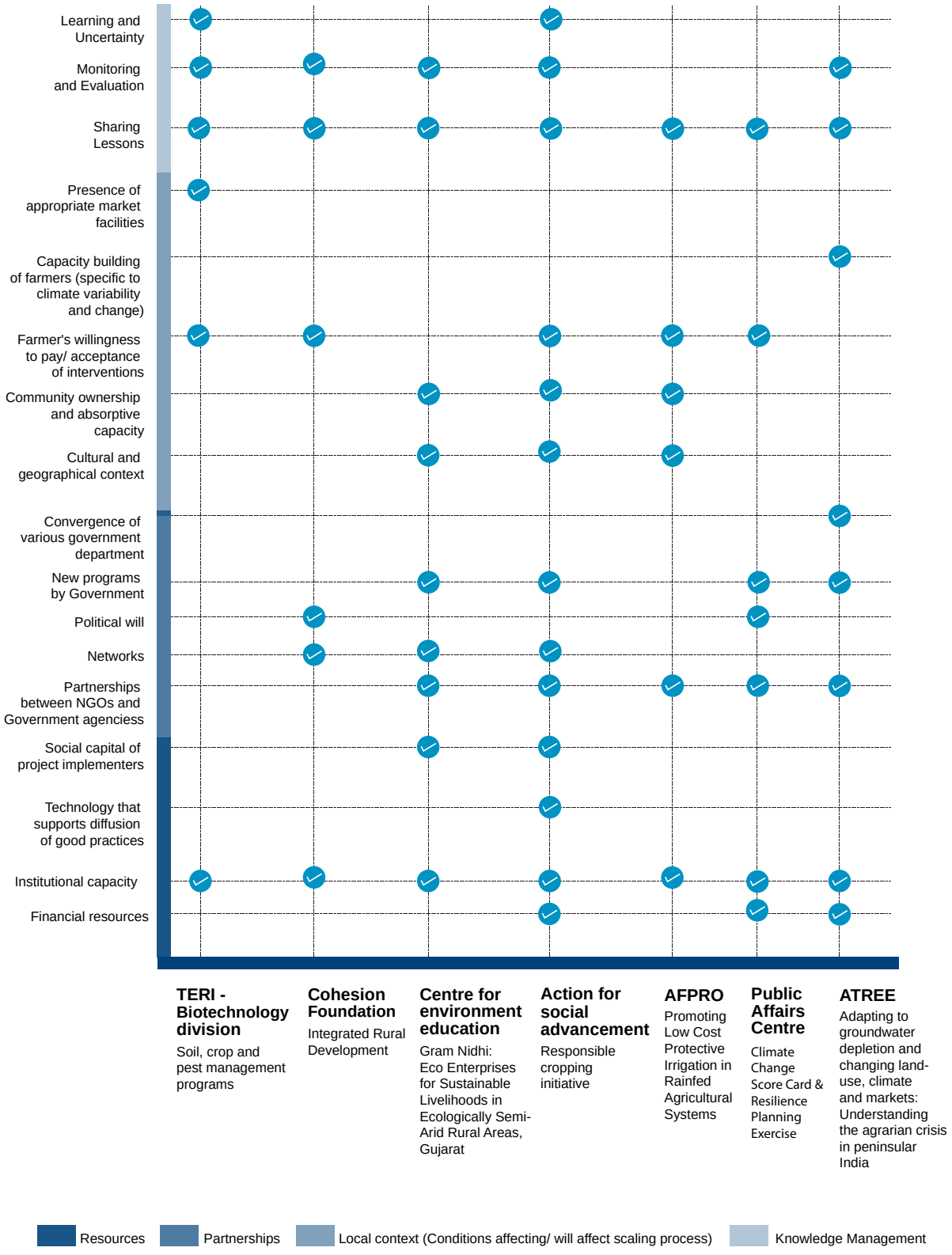
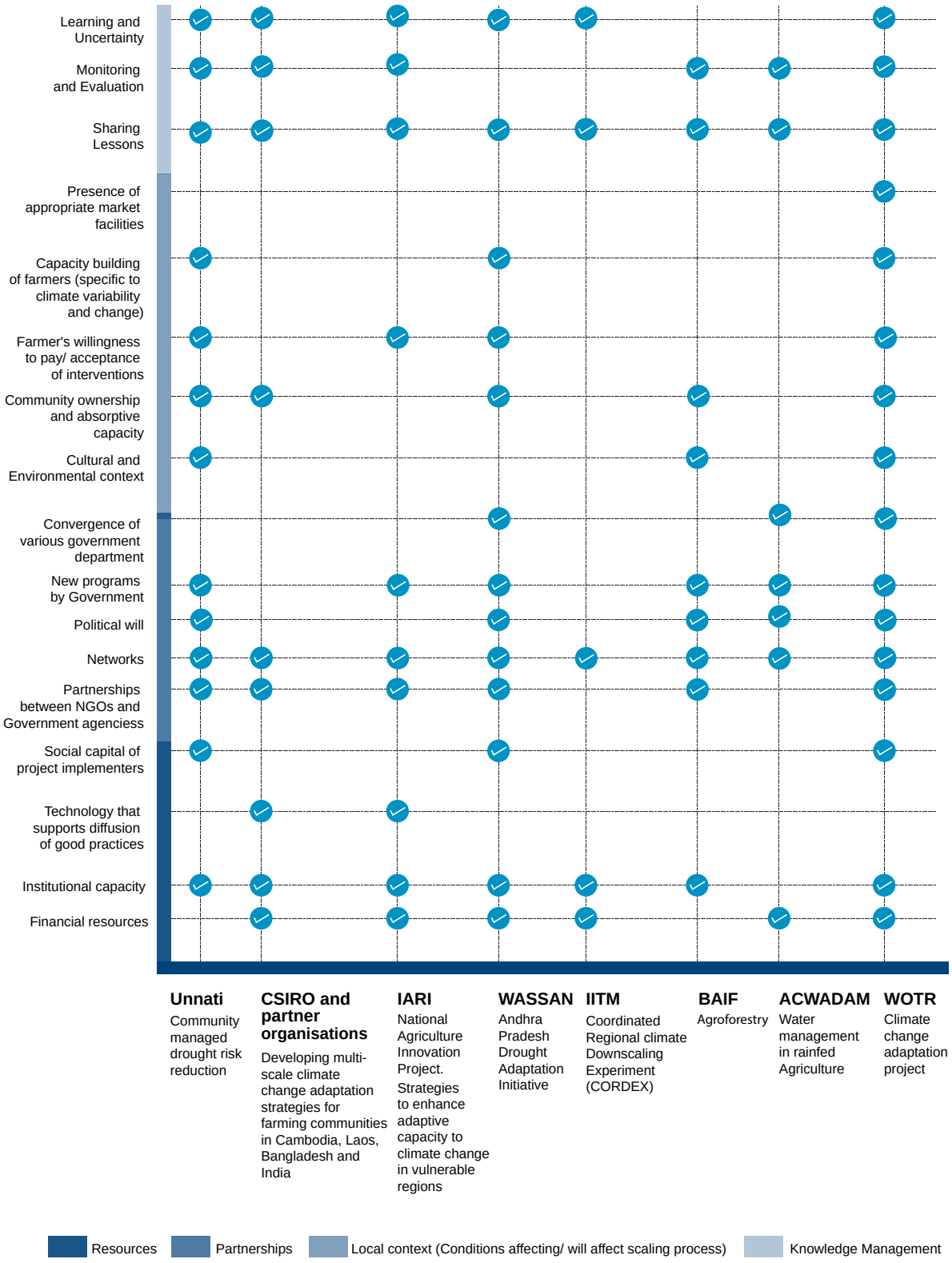


Figure 14 | **Projects by scaling conditions met**

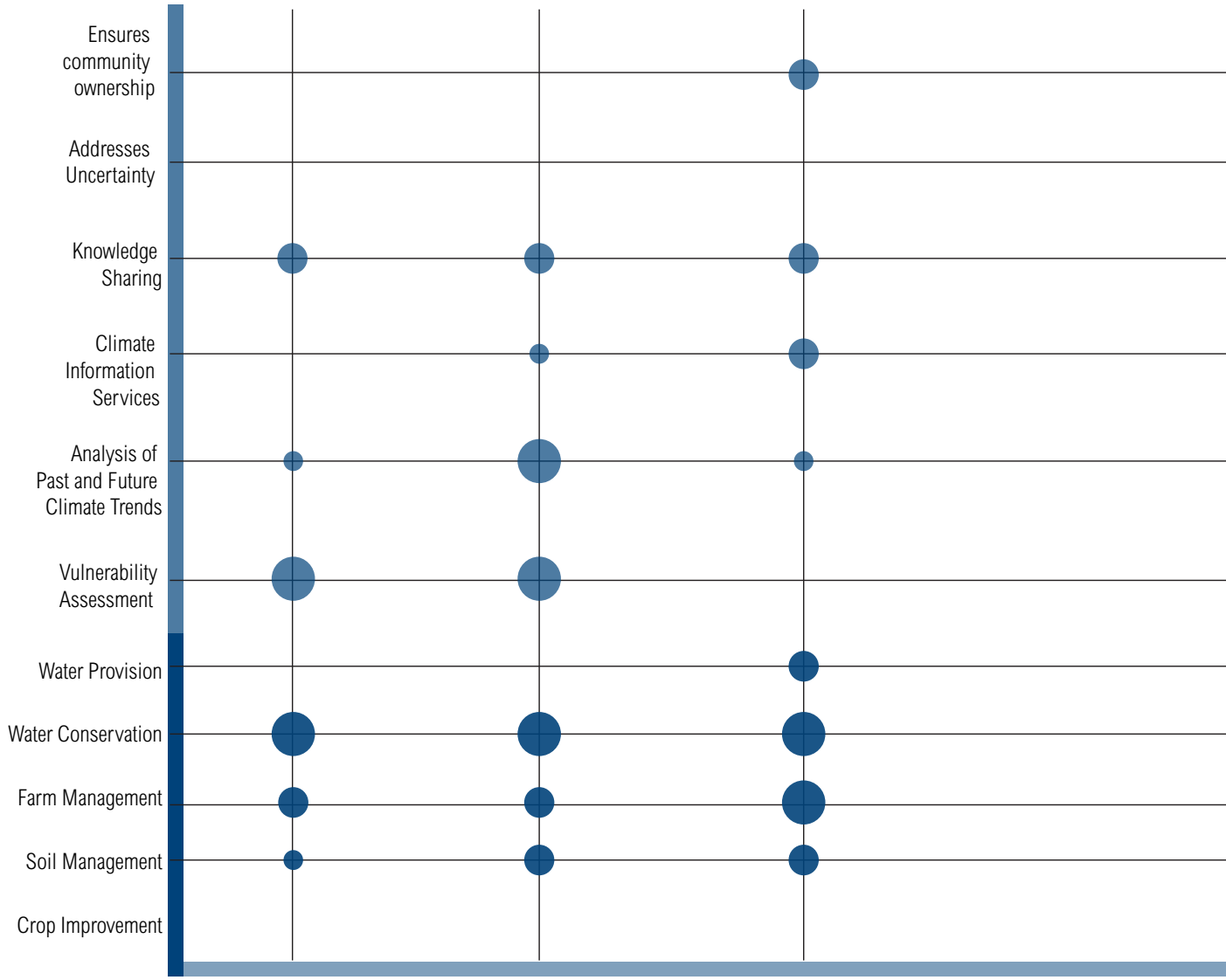


ANNEX H: PROJECTS FROM SCOPING INTERVIEWS

Figure 15 summarizes the twenty-one adaptation projects reviewed for this report, and characterizes their interventions using five categories of agricultural activities currently employed in India's rainfed agriculture. The larger the dot, the greater the organization's focus (weighed by number of activities done, beneficiaries reached, beneficiaries that adopted the activity etc.) on a given category of intervention. Most projects include more than one intervention type. The table also identifies the presence or absence in each project of the good practice indicators described in Chapter 2. For all twenty-one projects, the authors interviewed a project manager or other relevant practitioner.

It is notable that only a small number of projects focused on crop improvement. The authors believe this is because there are a few specific agriculture research institutes that work solely on crop improvement, and these institutes disseminate knowledge about the commercially viable, most appropriate technology to other institutes, but they were not interviewed for this report. Another trend is that most of the projects (nineteen) focus on water conservation and provision, which directly addresses water shortage and drought. As many as twelve organizations that work on water conservation also work on farm management practices. Project managers at these organizations expressed the opinion that unless farm management practices are introduced along with water conservation assets, crop and soil productivity cannot be achieved. Eleven projects look at integrated agricultural development. According to the organizations managing these projects, in order to reduce the vulnerability of agriculture to climate variability, projects should include efforts in all sectors (soil, crop, pest, and water), and not just one or two.

Figure 15 | **Summarized assessment of 21 projects**



GIZ

Climate change Adaptation in Rural Areas of India - Demonstration projects

GIZ

Climate change Adaptation in Rural Areas of India - Climate proofing of watersheds

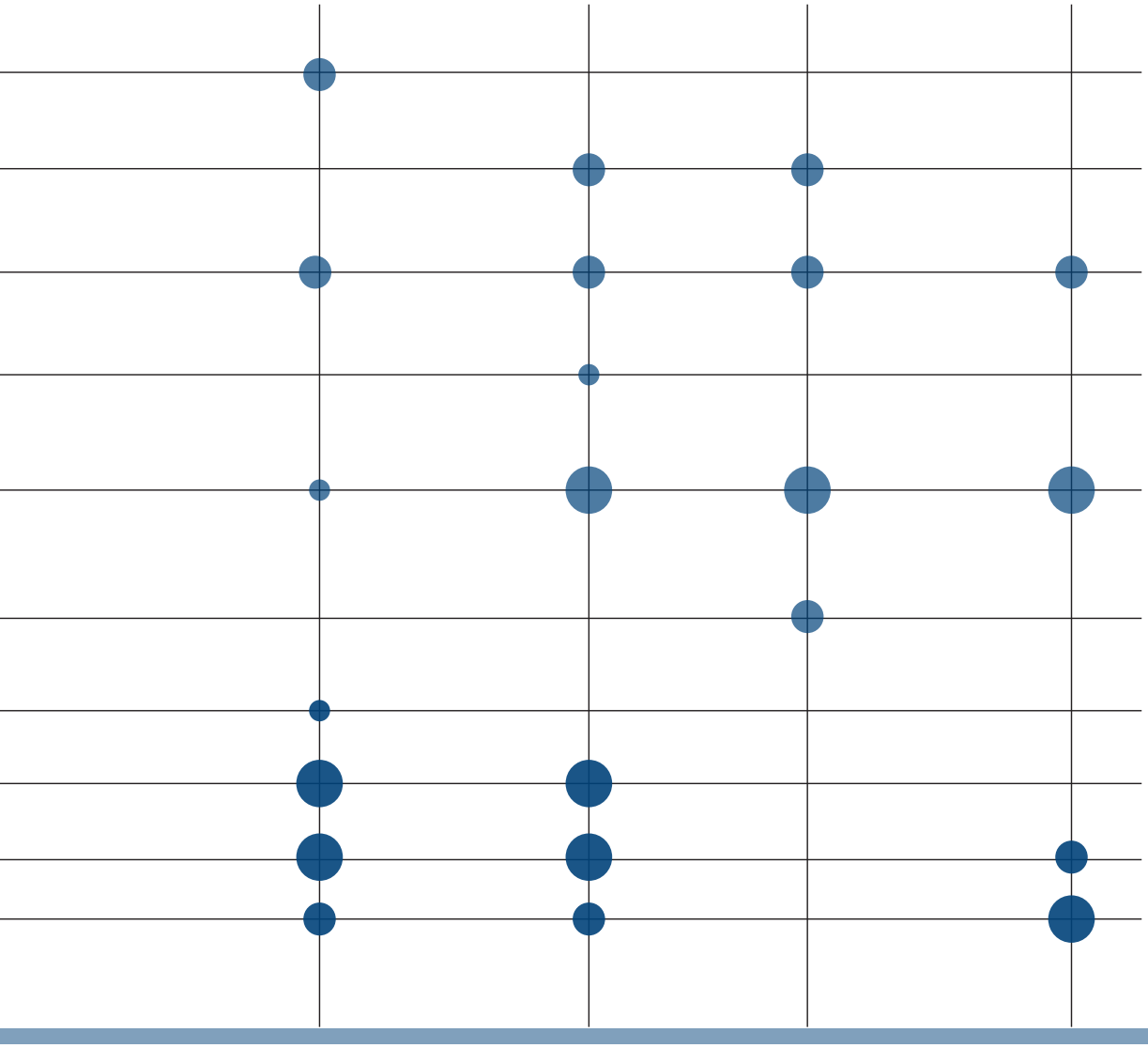
Development Alternatives

Integrated Watershed Management Programme in the Niwari of Madhya Pradesh

CATEGORIES OF AGRICULTURAL ADAPTATION ACTIVITIES

INDICATORS OF GOOD ADAPTATION PRACTICES

PILOT STAGE | MINIMAL SCALING | SCALING UP UNDER PROGRESS



Development Alternatives

Development of WADI among Sahariya tribal families in Bundelkhand Region in U.P.

WWF

Thirsty Crops

TERI

Too much, too less, too bad? - Adapting to climate change impacts on water quantity and quality in the drylands of Maharashtra, India

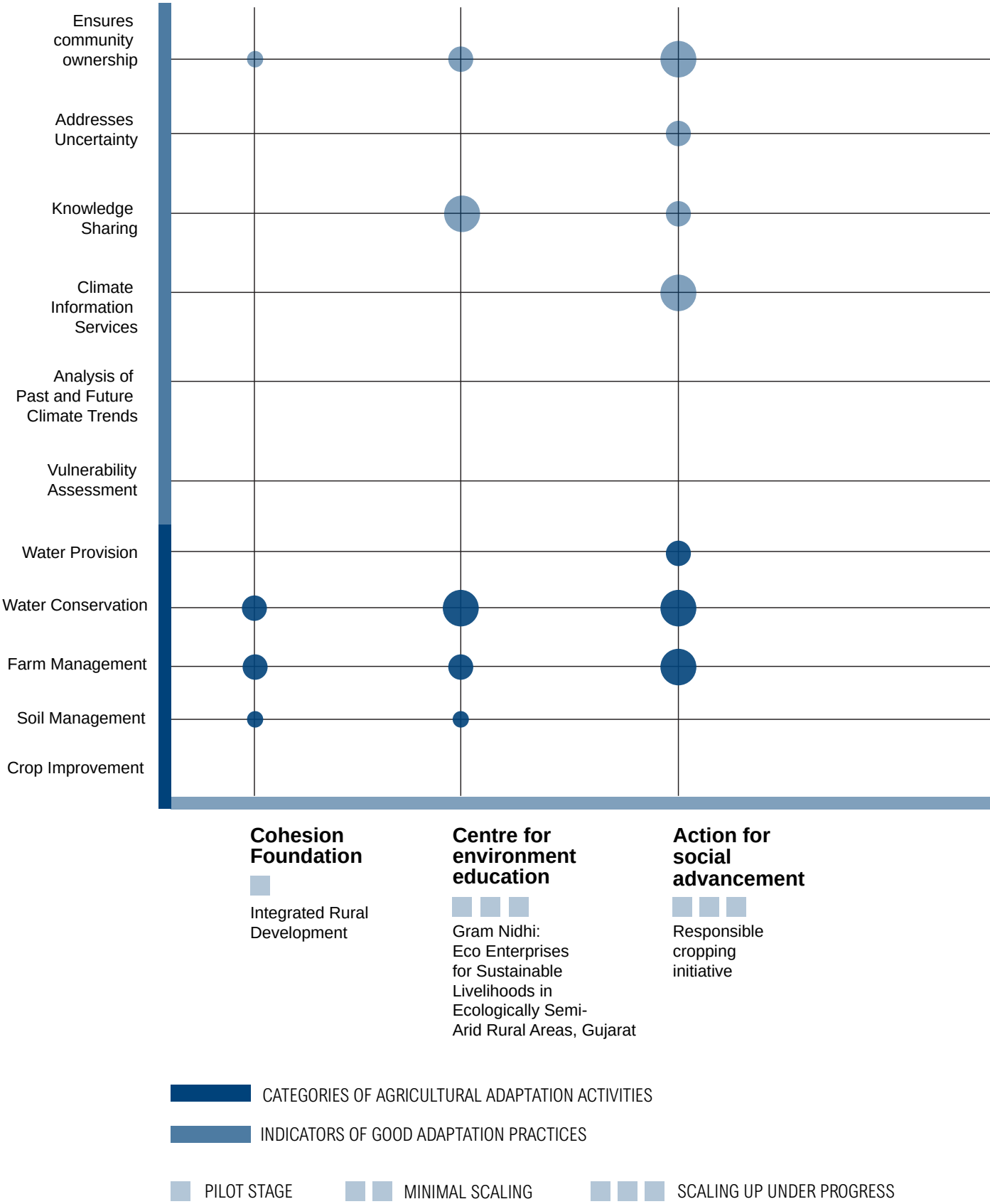
TERI - Biotechnology division

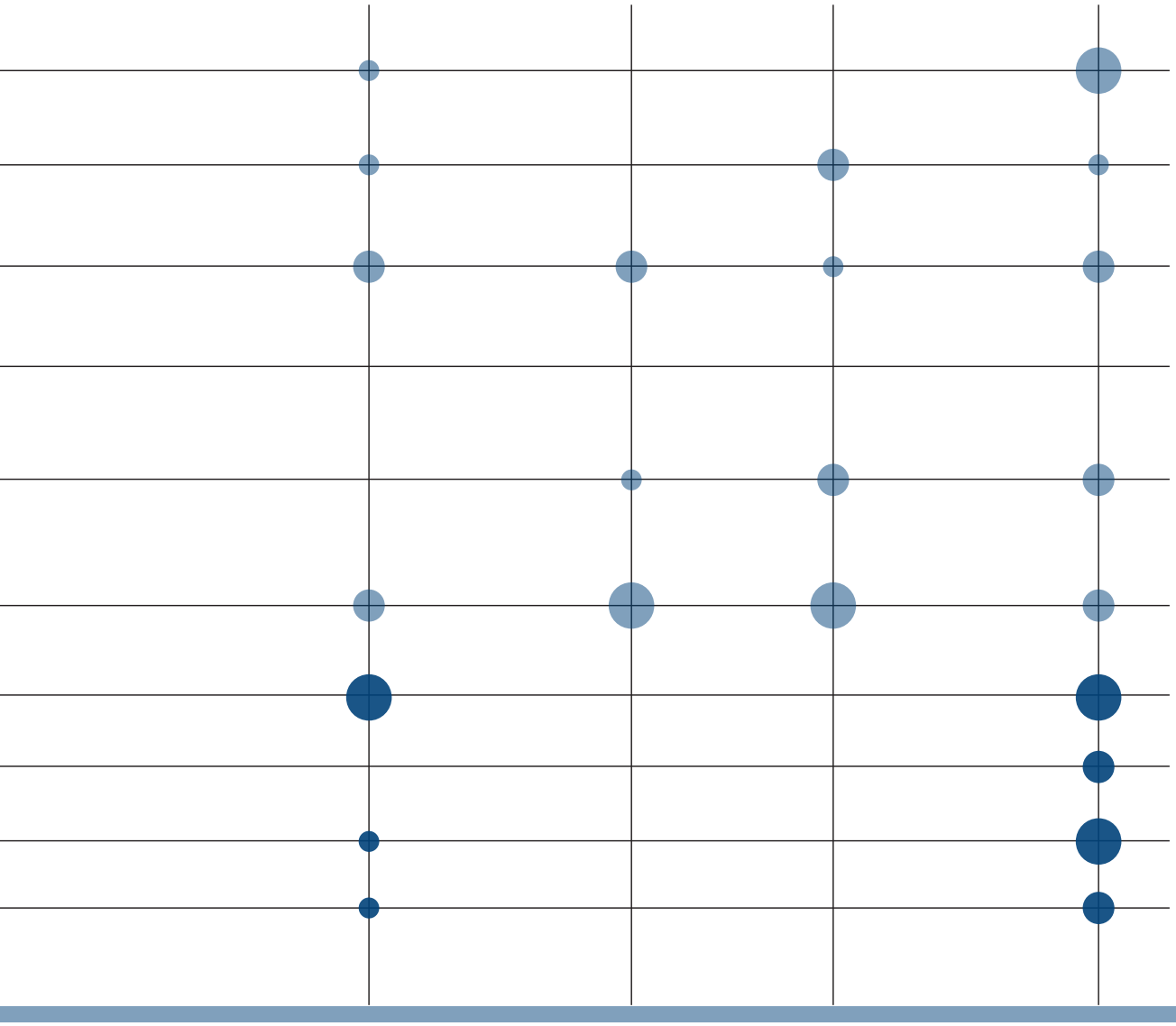
Soil, crop and pest management programs

HIGH FOCUS MEDIUM FOCUS LOW FOCUS

HIGH PRIORITY MEDIUM PRIORITY LOW PRIORITY

Figure 15 | **Summarized assessment of 21 projects**





AFPRO

Promoting Low Cost Protective Irrigation in Rainfed Agricultural Systems

Public Affairs Centre

Climate Change Score Card & Resilience Planning Exercise

ATREE

Adapting to groundwater depletion and changing land-use, climate and markets: Understanding the agrarian crisis in peninsular India

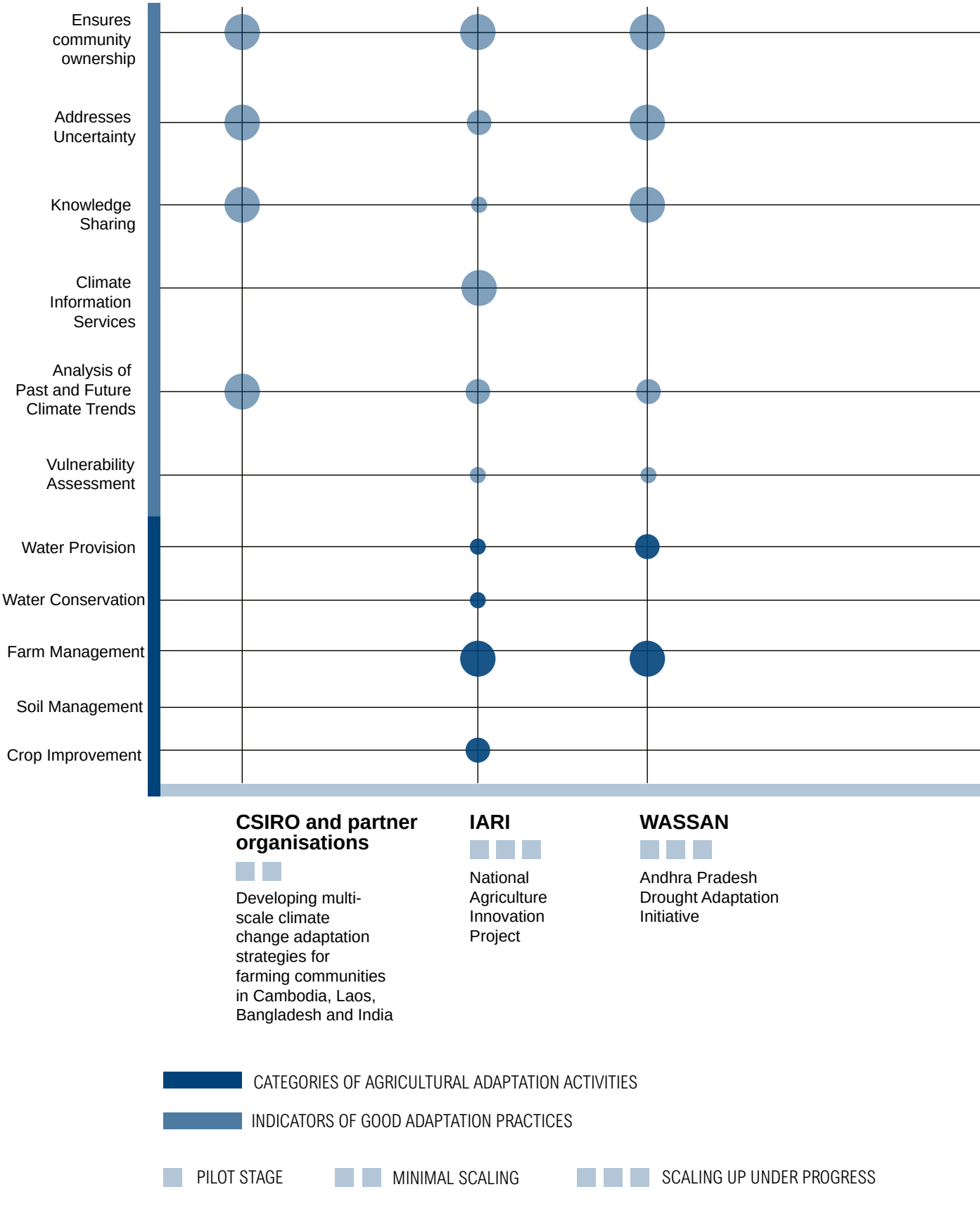
Unnati

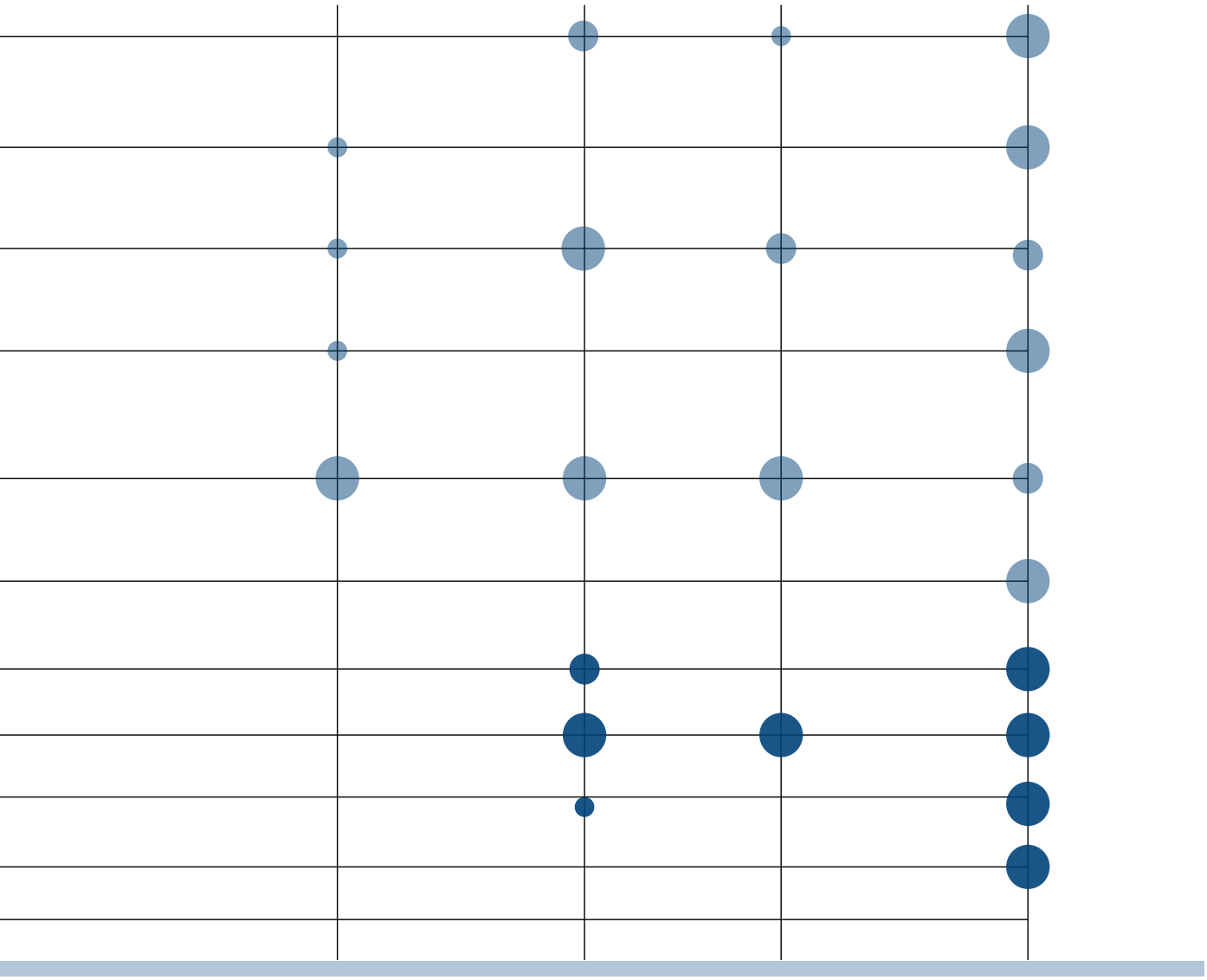
Community managed drought risk reduction

HIGH FOCUS MEDIUM FOCUS LOW FOCUS

HIGH PRIORITY MEDIUM PRIORITY LOW PRIORITY

Figure 15 | **Summarized assessment of 21 projects**





IITM

Coordinated Regional climate Downscaling Experiment (CORDEX)

BAIF

Agroforestry

ACWADAM

Water management in rainfed Agriculture

WOTR

Climate change adaptation project

HIGH FOCUS MEDIUM FOCUS LOW FOCUS

HIGH PRIORITY MEDIUM PRIORITY LOW PRIORITY

ANNEX I: KEY NATIONAL AGRICULTURE POLICIES AND SCHEMES

NAME OF POLICY/ DOCUMENT	ADAPTATION LINKAGES
National Agriculture Policy (2000) *Primarily focused on agricultural production and growth* Mandated by the Government of India	Emphasis on research particularly use of biotechnology to promote water-saving, drought-resistant, and pest-resistant crop varieties Promote livelihoods through value addition to agricultural products Integrated nutrient and pest management Provision of insurance policies for farmers
National Policy for Farmers (2007) *To address water issues, specific to arid areas* Mandated by the Government of India	Tailor made cropping systems for three different weather codes (normal, drought and flood codes) with an aim to optimize resources Promote water saving measures Climate risk management at the local level Promotion of livestock insurance as a risk management strategy
Vision Document for Harnessing Opportunities in Rainfed Areas (2008)—National Rainfed Agriculture Authority *To guide specific initiatives and harness innovative policies, knowledge, technologies, and opportunities for holistic and sustainable development of rainfed areas*	Exclusively focused on preparing perspective plans for rainfed agriculture areas in specific states Design of appropriate farming and livelihood systems for rainfed conditions

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ENDNOTES

1. "Dalit" is a designation for a group of people traditionally regarded as untouchable in the Indian caste system. Presently the Government of India recognizes these groups as "scheduled caste" (SC) and "scheduled tribes" (ST). The term "dalit" is used interchangeably with SC and ST. These groups are considered vulnerable because of unequal access to education and common property resources, and restrictions on where they can live and the kinds of jobs they can take up for a living.

2. A Panchayat is an Indian local self-government organization of the panchayati raj system at the village or small-town level, and has a "Sarpanch" as its elected head.

3. A World Bank report—The Andhra Pradesh Drought Adaptation Initiative: Lessons from Community-Based Adaptation Approaches to Strengthen Climate Resilience—was used to substantiate the findings of this case study. The case summary table is largely based on findings from that report. However, the implementation narrative, priority areas and concerns, as well as key learnings, are based on an interview with staff from WASSAN, the lead technical agency for the project.

4. Based on the interviews with A. Ravindra.

5. Authors' inference based on information from two interviews with A. Ravindra of WASSAN (2014) and the World Bank APDAI report (2011).

6. Based on Annex H and G which categorizes activities that show scaling of certain activities based on program evaluations, knowledge sharing by leveraging key lessons learned, and a medium scaling risk since scaling has been based on project evaluations.

7. The diversified farming system includes three sub-activities: (i) crop diversification including tree crops and fodder crops and intercropping, (ii) soil improvement through application of compost and green manure, mulching, and application of tank silt, and (iii) application of Non-Pesticide Management technique (World Bank 2011).

8. Evidence for this claim is found in the World Bank project report on lessons learned. Benefit-cost analysis conducted for each of the nineteen pilot activities was one of the bases on which scaling was secured. (World Bank, 2011). Moreover, the project was implemented on the basis of a multi-stakeholder approach using self-help groups at the village level to build local capacities and ensure cost-effective and inclusive implementation.

9. www.rainfedindia.org

10. Special measures include soils, seeds, water, millets, fisheries, livestock, credit, markets, and institutions as research, knowledge-sharing, and advocacy themes.

11. Hereafter referred to as the NAIP sub-project

12. NAIP comprises five components: (i) management of change in the Indian National Agricultural Research System; (ii) production to consumption systems; (iii) sustainable rural livelihood security; (iv) basic and strategic research; and (v) monitoring & evaluation (M&E); http://naip.icar.org.in/

13. The evaluation is in progress, as stated by the scientist at IARI during the interview.

14. Refer to Nokia OVI tools offered by Tata DOCOMO as part of their "Life Enhancing Services." http://www.tatadocomo.com/dive-in-enhancing-services.aspx.

15. The NICRA project is active in 125 districts. The main objective is to develop climate smart villages with main focus on strengthening agricultural activities. In the deep dive interview, a scientist from IARI indicated towards an ongoing process of integration of some of the livelihood components from the NAIP sub-project into NICRA.

16. It is a cropping season, which is the period between October (end of monsoon) and April (spring).

17. From the interviews with Naresh Kumar, Principal Scientist, NICRA, IARI.

18. Households were compared along three categories of farming systems. The first set includes households that earned a net profit of Rs. 10,000 only from agriculture. This is followed by households earning a net profit of Rs. 34,500 from agriculture and livestock, with differential areas of land for agriculture and livestock. The third set of households has fisheries in addition and the net profit is around Rs. 30,500 (CESCRA 2013).

19. Please refer to the report titled "Technologies for Climate Change Adaptation" for the results from implementation of the activities identified for scaling through NICRA and other projects at IARI (CESCRA 2013).

20. From the interview with Marcella D'Souza, Executive Director, WOTR.

21. Community Driven Vulnerability Evaluation–Programme Designer (CoDriVE–PD) is a recumbent tool converging two well known methodologies and is built on the five capitals framework. It adopts a systems thinking approach which covers interrelationships and the interdependencies between them. Refer to http://wotr.org/sites/default/files/WOTR-PD-handbook-Final-Web-Version.pdfhttp://wotr.org/sites/default/files/WOTR-PD-handbook-Final-Web-Version.pdf

22. Community Driven Vulnerability Evaluation–Livelihood Assessment (CoDriVE–LA) framework combines CASDAAT (Climate Adaptive Sustainable Development Assessment and Adjustment Tool) and LM3 (Local Money Multiplier), which looks at collectively understanding the livelihoods

exposed to vulnerabilities and its relation to climate change. This assessment helps the community and the interveners to decide and prioritize the strategies. Refer to http://www.wotr.org/tools_frameworks/codrive-livelihoods for further details.

23. Note from the interview with Marcella D'Souza - The extension of the CCA project may be good if implemented in entirety with adaptation in focus; however depending on the interest of donors, if watershed is treated and according to the vulnerability assessments, specific components may be taken up.

24. As noted by Marcella D'Souza, Executive Director, WOTR

25. Based on the interview with Binoy Acharya of Unnati.

26. See annual report of Unnati on http://www.unnati.org/annual-report.html.

ABBREVIATIONS AND ACRONYMS

ACWADAM	Advanced Center for Water Resources Development and Management
AFPRO	Action for Food Production
APDAI	Andhra Pradesh Drought Adaptation Initiative
ATREE	Ashoka Trust for Research in Ecology and Environment
BCRD	Building Community Resilience on Drought
CAZRI	Central Arid Zone Research Institute
CCA	Climate Change Adaptation
CRIDA	Central Research Institute for Dryland Agriculture
CSIRO	Commonwealth Scientific and Industrial Research Organisation
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ICAR	Indian Council of Agricultural Research
ICARDA	International Center for Agricultural Research in Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFS	Integrated Farming System
IITM	Indian Institute of Information Technology and Management
IPCC	Inter-Governmental Panel on Climate Change
M&E	Monitoring and Evaluation
NABARD	National Bank for Agriculture and Rural Development
NAIP	National Agricultural Innovation Project
NAPCC	National Action Plan for Climate Change
NGO	Non-Governmental Organization
NICRA	National Initiative on Climate Resilient Agriculture
MGNREGS	Mahatma Gandhi National Rural Employment Guarantee Scheme
SEWA	Self-Employed Women's Association
SCCDRR	Strengthening Community Capacity on Disaster Risk Reduction in Rajasthan (project)
TERI	The Energy Research Institute
UNDP	United Nations Development Programme
WASSAN	Watershed Support Services and Activities Network
WOTR	Watershed Organisation Trust
WRI	World Resources Institute
WWF	World Wide Fund for Nature

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ABOUT THE AUTHORS

Arivudai Nambi Appadurai, Strategy Head (Vulnerability & Adaptation Initiative), WRI

Contact: NAppadurai@wri.org

Moushumi Chaudhury, Associate (Vulnerability & Adaptation Initiative), WRI

Contact: MChaudhury@wri.org

Ayesha Dinshaw, Associate (Vulnerability & Adaptation Initiative), WRI

Contact: ADinshaw@wri.org

Namrata Ginoya, Research Analyst (Vulnerability & Adaptation Initiative), WRI

Contact: NGinoya@wri.org

Heather McGray, Director (Vulnerability & Adaptation Initiative), WRI

Contact: HMcGray@wri.org

Lubaina Rangwala, Senior Project Associate (Vulnerability & Adaptation), WRI

Contact: Lubaina.Rangwala@wri-india.org

Shreyas Srivatsa, Independent Consultant

Contact: sh.srivatsa@gmail.com

ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

Our Challenge
Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our Vision
We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

Our Approach

COUNT IT
We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT
We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT
We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

ABOUT SUGAP

The Scaling Up Good Adaptation Practices (SUGAP) project is a partnership between the Swiss Agency for Development and Cooperation (SDC), World Resources Institute (WRI) and the Watershed Organisation Trust (WOTR) to further the development of climate resilience in semi-arid regions of India. The partnership conducts research, convening, and outreach to promote climate change adaptation policies and funding programs at national and international levels.

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WORLD
RESOURCES
INSTITUTE

10 G STREET NE
SUITE 800
WASHINGTON, DC 20002, USA
+1 (202) 729-7600
WWW.WRI.ORG